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ABSTRACT

Six competency catalogs of tasks for industrial arts programs are presented. These include catalogs in Architectural Drawing, Basic Technical Drawing, Electricity and Electronics, Energy and Power, Engineering Drawing, and Graphic Communications. The purpose of each catalog is to establish a basis for program content selection and criterion levels from which one may measure to see if individual learners have achieved minimal competence. Each catalog begins with an introduction, format description, course description, course goals, and suggested topical outline. The remainder of the catalog is comprised of task statements. Each task follows a typical format that includes the following sections: (1) Area of Competency, which identifies the industrial arts course for which the task was prepared: (2) Content/Concept, which identifies the sub-area with which the particular task is associated: (3) Task, which identifies the knowledge, skills, or attitudes that the learner should possess after instruction: (4) Criterion Referenced Measure, which provides the means of determining whether the learner can successfully perform the task; and (5) Performance Goals, which identifies sub-tasks that lead to the development of the knowledge, skills, and attitudes identifed in the task. (LRA)

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basic technical drawing
engineering drawing
architectural drawing
electricity and electronics
energy and power
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Industrial Arts Education Service
Department of Education
Commonwealth of Virginia
Richmond, VA 23216

1979

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PREFACE

In today's complex society, learners need to be prepared to experience situations they will encounter in the future. Consequently, news media presentations have evidenced an intense and genuine concern on the part of government and the citizenry about the quality of American education. Accountability has become an accepted rule in an effort to improve the process of education for the benefit of learners. A national movement to improve education has produced several important developments - among these is Competency-Based Instruction.

Competency-based instruction is a means of education based upon the identification and attainment of prespecified, role-relevant outcomes. To be competent implies that a learner be well qualified and possess certain abilities and qualities within a specified content area. That is, competency based instruction is a system designed to develop prespecified knowledge, skills, and attitudes in learners who are enrolled in an educational program.

Included within this publication are eight competency catalogs of tasks for Virginia Industrial Arts Program. These include catalogs on Architectural Drawing, Basic Technical Drawing, Electricity and Electronics, Energy and Power, Engineering Drawing, Graphic Communications, Metals Technology, and Woods Technology. The purpose of these are to establish a basis for program content selection and criterion levels from which one may measure to see if individual learners have achieved a minimal level of competence through study in a particular course. In this manner a means to improve education and its accountability to the citizenry can be designed based upon the identification and attainment of prespecified outcomes for the industrial arts content area.

A CATALOG OF TASKS
FOR
COMPETENCY-BASED INSTRUCTION
IN

Basic Technical Drawing

VIRGINIA
INDUSTRIAL ARTS

Industrial Arts Education Service
Department of Education
Commonwealth of Virginia
Richmond, Virginia 23216
1979

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INTRODUCTION

In the summer of 1977, The Industrial Arts Curriculum K-12 was introduced. This plan outlined the preferred courses, course sequences, and purposes which should be addressed in Virginia industrial arts programs. However, the model curriculum plan did not establish exact knowledge, skills, and attitudes which all learners should possess as they exit particular programs.

The purpose of the following competency catalog of tasks is to establish a basis for program content selection and criterion levels from which one may measure to see if individual learners have achieved a minimal level of competence through study in a particular course. In this manner a means to improve education and its accountability to citizenry can be designed based upon the identification and attainment of prespecified outcomes for the industrial arts content area. Although this catalog is designed and presented in a sequencial order of task statements, it does not mean that it must be structured into local programs in this order. Individual instructors may choose to restructure the sequence of competency tasks to meet local needs.

In preparing this catalog considerable research and validation was undertaken to specify those minimal tasks which every learner enrolling in the course should be able to perform. The format of this and other catalogs includes the following areas: area of competence, content/concept, task, criterion referenced measure, and performance guides. The area of competence identifies the industrial arts course for which the particular task was prepared. Content/concept identifies the sub-area with which the particular task is associated. The task is the knowledge, skills or attitudes which the learner should possess after instruction in the industrial arts class. Criterion references measures are means to identify if the learner can successfully perform the stated task and finally, performance guides are sub-tasks which lead to the development of the knowledge, skills and attitudes

identified in the tasks. These areas are illustrated in Table 1. It should be noted that performance objectives have been omitted from the catalogs of tasks. This was done to allow individual instructors to develop objectives they see necessary to meet the local learning environment.

In Table 2 is identified the location of this course in the total program of industrial arts for Virginia. Other competency catalogs are contained in this publication and the remaining catalogs may be obtained from the Industrial Arts Education Service, Division of Vocational Education, Department of Education, P.O. Box 6Q, Richmond, Virginia 23216.

FORMAT DESCRIPTION

AREA OF COMPETENCE: Identifies the industrial arts course for which the particular task was prepared.

CONTENT/CONCEPT: Identifies the sub-area which the particular task is associated.

TASK: Identifies the knowledge, skills, or attitudes which the learner should possess after completing instruction in the industrial arts class.

CRITERION REFERENCED MEASURE: The means to identify if the learner can successfully perform the stated task.

PERFORMANCE GUIDES: Identifies sub-tasks which lead to the development of the knowledge, skills, and attitudes identified in the tasks.

TABLE 1

The Industrial Arts Curriculum

Level	Goal	Program
Elementary School	Learning Reinforcement	Industrial Arts activities integrated within the elementary curriculum
Middle or Junior High School	Orientation and Exploration	Exploring Technology Modern Industry Construction Manufacturing
High School	Technical	Communication Technology Materials and Processes Technology Power and Transportation Technology Architectural Drawing ■ Basic Technical Drawing Electricity and Electronics Energy and Power Engineering Drawing Graphic Communications Metals Technology Woods Technology
	Personal Enrichment	General Industrial Arts Industrial Crafts

TABLE 2

BASIC TECHNICAL DRAWING

COURSE DESCRIPTION:

This basic mechanical drawing course provides students the opportunity to experience the basic language of industry and technology. Students gain a basic background of skills and understandings in the broad scope of mechanical drawing or drafting. Specially recommended course for the future engineering, architecture or technology student.

COURSE GOALS:

Experiences and activities of this INDUSTRIAL ARTS course will enable the student to:

1.1 narrate the contributions which drafting and design make in the development, manufacture, or construction of commercial products.

1.2 read and interpret multi-view, pictorial and schematic drawings.

1.3 assess individual abilities and interests as they relate to current opportunities in drafting and design fields.

2.1 prepare multi-view, pictorial and schematic drawings through the use of instruments utilizing the proper drawing methods and conventions.

2.2 evaluate the quality of current drafting room products from tracing to final presentation drawings.

2.3 utilize resource and reference materials essential to major drafting-design areas.

3.1 evaluate positive and negative aspects of various drafting-design related positions in terms of individual interests and aptitudes.

SUGGESTED TOPICAL OUTLINE:

I. Introduction to Technical Drawing

II. History of Drafting

III. Freehand Sketching

IV. Lettering

V. Use of Instruments

VI. Line Weights and Techniques

VII. Geometric Construction

VIII. Scale Drawing

IX. Orthographic Projection

X. Dimensioning

XI. Shop Processes

XII. Pictorial Drawing

XIII. Sections and Conventions

XIV. Auxiliary Drawings

XV. Reproduction Processes

XVI. The Industrial Arts Student Association

TASK # 1

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Introduction to Technical Drawing

TASK: Define Technical Drawing.

CRITERION REFERENCED MEASURE: Define technical drawing as the universal graphic language of industry which conveys the draftsman's ideas to others.

PERFORMANCE GUIDES:

1. Read assignment on the definition of technical drawing.
2. Observe examples of technical drawings.
3. Participate in class discussions on how technical drawing relates to communication and the transfer of ideas.

TASK # 2

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Introduction to Technical Drawing.

TASK: Discuss the Types of Job Opportunities in Technical Drawing.

CRITERION REFERENCED MEASURE: Evaluate aero-space drafting, architectural drafting, electrical drafting, graphic arts, industrial design, mechanical drafting, patent drawing, piping drafting, production and technical illustration, structural drafting, teaching drafting, and topographic drafting as types of jobs in the technical drawing field.

PERFORMANCE GUIDES:

1. Research a type of job opportunity in the field of technical drawing.
2. List the education and training required, wages, advancement opportunities and types of drawings required for the researched technical drawing jobs.
3. Discuss in class several types of job opportunities in the field of technical drawing.
4. Observe audio visual and/or employment agents presentations of job opportunities in technical drawing.

TASK # 3

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: History of Drafting

TASK: Discuss the Use of Standards in Drafting and Design.

CRITERION REFERENCED MEASURE: Describe the purpose for standards and list some nationally and internationally recognized types of standards.

PERFORMANCE GUIDES:

1. Read assignment on standards used in drafting and design.
2. Participate in class discussion on standards used in drafting.

TASK # 4

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: History of Drafting

TASK: Discuss the Importance of Drafting as it Relates to the Manufacturing and Construction Industry.

CRITERION REFERENCED MEASURE: Describe the need for drafting to convey ideas into visual communication, to convey specifications into a working drawing, and to transfer working drawings into the actual object using manufacturing and construction processes.

PERFORMANCE GUIDES:

1. Read assignment on the uses of drafting in manufacturing and construction processes.
2. Participate in class discussion on the importance of drafting as it relates to the manufacturing and construction industry.
3. View films on the use of mechanical drawings in industry.
4. Observe samples of mechanical drawings used by industry.

TASK # 5

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Freehand Sketching

TASK: Discuss the Reason for Freehand Sketching.

CRITERION REFERENCED MEASURE: Describe freehand sketching's value as a drawing by which the draftsman presents his ideas to others.

PERFORMANCE GUIDES:

1. Define freehand sketching.
2. Read assignment on reasons for freehand sketching.
3. Discuss the applications of freehand sketching.
4. View samples of freehand sketching.

TASK # 6

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Freehand Sketching

TASK: Develop Skill in Sketching Proportionately.

CRITERION REFERENCED MEASURE: Develop skills in sketching drawings in which the lines are proportional to one another.

PERFORMANCE GUIDES:

1. Read assignment on the definition of proportion.
2. Sketch squares, circles, arcs and three-dimensional objects in which the lines are proportional to each other without the aid of a scale.

TASK # 7

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Freehand Sketching

TASK: Develop Skills in Orthographic Sketching.

CRITERION REFERENCED MEASURE: Develop skills in sketching straight lines, specified angles, circles and arcs.

PERFORMANCE GUIDES:

1. Observe demonstrations on the correct way to sketch straight lines, specified angles, circles and arcs.
2. Sketch orthographic views containing straight lines, specified angles, circles and arcs using only a drawing pencil, drawing board, and eraser.

TASK # 8

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Freehand Sketching

TASK: Develop Skills in Sketching Pictorial Drawings.

CRITERION REFERENCED MEASURE: Develop skills in sketching oblique and isometric drawings.

PERFORMANCE GUIDES:

1. Read assignment on the correct way to sketch oblique and isometric drawings.
2. Observe a demonstration on the correct way to sketch oblique and isometric drawings.
3. List the purposes of oblique and isometric drawings.
4. Sketch oblique and isometric drawings.

TASK # 9

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Lettering

TASK: Develop Skills in Freehand Lettering.

CRITERION REFERENCED MEASURE: Develop skills in making lettering guidelines, in using a lettering triangle or instrument in vertical lettering and in lettering composition.

PERFORMANCE GUIDES:

1. Observe a demonstration on the correct way to make guidelines.
2. Observe a demonstration on the correct way to make vertical letters.
3. Read assignment on good lettering techniques.
4. Demonstrate the correct lettering techniques to letter title blocks and dimensions for sketched drawings.

TASK # 10

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Use of Instruments

TASK: Develop Skills in Using Drafting Instruments.

CRITERION REFERENCED MEASURE: Develop skills in the correct use of a drafting board, T-square, drawing sheets, drafting tape, drafting pencils, erasing shields, triangles, scales, irregular curves, dividers, compasses, and protractors.

PERFORMANCE GUIDES:

1. Read assignments concerning the correct use of the above drafting instruments.
2. Observe demonstrations of the proper use of the above drafting instruments.
3. Observe examples of acceptable drawings in which drafting instruments were used.
4. Solve simple technical drawing problems using drafting equipment.

TASK # 11

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Use of Instruments

TASK: Develop Skills in Line Work.

CRITERION REFERENCED MEASURE: Develop skills in drawing visible, hidden, and center lines in a technical drawing.

PERFORMANCE GUIDES:

1. Read assignments on line weights and techniques.
2. Observe correctly drawn visible, hidden, and center lines in a technical drawing.
3. Discuss the relationship between the degree of hardness and the grade rating of graphite lead in drawing pencils.
4. Draw with different grades of drawing pencils.
5. Solve simple technical drawing problems using the correct line weights and symbols.

TASK # 12

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Geometric Construction

TASK: Develop Skills in Drawing Geometric Constructions.

CRITERION REFERENCED MEASURE: Develop skills in drawing angles, triangles, concentric and eccentric circles, squares, rectangles, bisected angles and lines, and tangent lines using drafting equipment.

PERFORMANCE GUIDES:

1. Observe demonstrations of the proper use of drafting equipment to draw geometric constructions.
2. Read assignments on the proper way to draw all of the above geometric constructions.
3. Solve technical drawing problems in geometric construction using drafting equipment.

TASK # 13

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Scale Drawing

TASK: Develop Skills in Scale Drawing.

CRITERION REFERENCED MEASURE: Develop skills in measuring with different types of scales and in converting drawings to different scales (sizes).

PERFORMANCE GUIDES:

1. Read assignments concerning the use of scales and drawing to scale.
2. Observe examples of drawings in different scales.
3. Measure the same drawing with different types of scales to see how the scales differ.
4. Observe the proper way to indicate scale on a drawing.
5. Indicate the scale on all drawings made.
6. Reduce and enlarge drawings using scales.

TASK # 14

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Orthographic Projection

TASK: Develop Skills in Drawing Orthographic Projections Using Drafting Equipment.

CRITERION REFERENCED MEASURE: Develop skills in drawing front, top and right side views of three-dimensional objects using drafting equipment.

PERFORMANCE GUIDES:

1. Observe the proper procedures for drawing orthographic projections using drafting equipment.
2. List the six possible planes involved in orthographic projection.
3. List three principle planes involved in orthographic projection.
4. Solve simple technical drawing problems involving multiviews, hidden lines, center lines, curved surfaces, and selection of views to draw using drafting equipment.

TASK # 15

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Dimensioning

TASK: Develop Skills in Size and Location Dimensioning.

CRITERION REFERENCED MEASURE: Develop skills in dimensioning procedures, the common abbreviations used on drawings, the size and location of dimensions on a drawing, the use of finish marks, and the dimensioning of tolerances and types of fits.

PERFORMANCE GUIDES:

1. Read assignments concerning dimensioning.
2. Observe dimensioned drawings which correctly use the general rules and abbreviations accepted by draftsmen.
3. Observe demonstrations on the generally practiced techniques of dimensioning.
4. Solve dimensioning problems using the generally practiced techniques of draftsmen.
5. Solve dimensioning problems with the common abbreviations used by draftsmen.
6. Solve size and location dimensioning problems using the general rules and common abbreviations of dimensioning.
7. Solve dimensioning problems including finishing marks, tolerances, and types of fits using nationally accepted techniques.

TASK # 16

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Shop Processes

TASK: Discuss the Different Manufacturing Processes that are Found in Industry.

CRITERION REFERENCED MEASURE: Describe the different manufacturing processes, such as casting, machining, forming and finishing, found in industry.

PERFORMANCE GUIDES:

1. Research an industrial manufacturing process and write a brief description of its procedures and uses.
2. Participate in class discussion on the manufacturing process.
3. View films on manufacturing processes.
4. Discuss the relation of drawings to finished manufactured products.

TASK # 17

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Pictorial Drawing

TASK: Develop Skills in Making Pictorial Drawings.

CRITERION REFERENCED MEASURE: Develop skills in drawing oblique, isometric and perspective drawings.

PERFORMANCE GUIDES:

1. Observe demonstrations on the proper way to draw oblique, isometric and perspective drawings.
2. Select the proper view to use as the front surface in oblique drawings.
3. Convert orthographic projections to pictorial drawings.
4. Draw to scale simple pictorial drawings.
5. Draw two types of oblique drawings: cavalier and cabinet.

TASK # 18

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Sections and Conventions

TASK: Develop Skills in Making Sectional Drawings.

CRITERION REFERENCED MEASURE: Develop skills in the use of conventional drafting practices and rules for sectional drawings.

PERFORMANCE GUIDES:

1. Observe demonstrations on sectional drawings.
2. Define cutting plane line and section lines.
3. Solve technical drawing problems in full sections, offset sections, broken sections, revolved sections and removed sections.

TASK # 19

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Auxiliary Drawings

TASK: Develop Skills in Drawing Auxiliary Views and Planes.

CRITERION REFERENCED MEASURE: Develop skills in drawing primary auxiliary views (front, top, and right-side auxiliary views) to show true size and true shape.

PERFORMANCE GUIDES:

1. Observe demonstrations on drawing auxiliary views.
2. Define auxiliary views.
3. Draw primary auxiliary views and planes.
4. Solve technical drawing problems in finding the true size and shape of an object through auxiliary views.

TASK # 20

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Reproduction Processes

TASK: List Several Types of Drafting Mediums used for Ink Drawings.

CRITERION REFERENCED MEASURE: List tracing paper, vellum, and tracing film mediums used for ink drawings.

PERFORMANCE GUIDES:

1. Discuss several types of mediums used for ink drawings.
2. Observe examples of mediums used for ink drawings.
3. List the desirable characteristics of drafting mediums used for ink drawings.
4. Draw on several types of mediums to differentiate between them.

TASK # 21

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: Reproduction Processes

TASK: Develop Skills in Mechanical Drawing Reproduction Processes.

CRITERION REFERENCED MEASURE: Develop skills in reproducing drawings by blueprint, electrostatic and microfilm processes.

PERFORMANCE GUIDES:

1. Observe demonstrations on the procedures used to reproduce drawings with the following processes:
   1. Blueprint
   2. Electrostatic
   3. Microfilm
2. Read assignments on the basic principle of how each process produces a copy.
3. Reproduce drawing using blueprint, electrostatic, and microfilm methods.

TASK # A.I.A.S.A.

AREA OF COMPETENCE: Basic Technical Drawing

CONTENT/CONCEPT: In Class Industrial Arts Student Association

TASK: Participation (involvement) in a democratic organization with activities using course content.

CRITERION REFERENCED MEASURE: Participate with other students in organized activities using industrial resources, leadership or followership, service or enterprise projects and recognition for workmanship.

PERFORMANCE GUIDES:

1. Organize class into personnel system for democratic decision making and leader/follower development.
2. Invite speakers to class and use resources of industry and technology from the community.
3. Carry out worthy group activities and projects to improve or serve school or community.
4. Operate an enterprise system to produce item of economic value.
5. Encourage competition in areas of course to motivate and recognize achievement.

NOTE: These performance guides are expanded in the publication titled Student Association Activities in Industrial Arts Instruction available from the Industrial Arts Service, Virginia Department of Education, Richmond, Virginia 23216.

A CATALOG OF TASKS
FOR
COMPETENCY-BASED INSTRUCTION
IN

Engineering Drawing

VIRGINIA
INDUSTRIAL ARTS

Industrial Arts Education Service
Department of Education
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The purpose of the following competency catalog of tasks is to establish a basis for program content selection and criterion levels from which one may measure to see if individual learners have achieved a minimal level of competence through study in a particular course. In this manner a means to improve education and its accountability to citizenry can be designed based upon the identification and attainment of prespecified outcomes for the industrial arts content area. Although this catalog is designed and presented in a sequencial order of task statements, it does not mean that it must be structured into local programs in this order. Individual instructors may choose to restructure the sequence of competency tasks to meet local needs.

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identified in the tasks. These areas are illustrated in Table 1. It should be noted that performance objectives have been omitted from the catalogs of tasks. This was done to allow individual instructors to develop objectives they see necessary to meet the local learning environment.

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CRITERION REFERENCED MEASURE: The means to identify if the learner can successfully perform the stated task.

PERFORMANCE GUIDES: Identifies sub-tasks which lead to the development of the knowledge, skills, and attitudes identified in the tasks.

TABLE 1

The Industrial Arts Curriculum

Level	Goal	Program
Elementary School	Learning Reinforcement	Industrial Arts activities integrated within the elementary curriculum
Middle or Junior High School	Orientation and Exploration	Exploring Technology Modern Industry Construction Manufacturing
High School	Technical	Communication Technology Materials and Processes Technology Power and Transportation Technology Architectural Drawing Basic Technical Drawing Electricity and Electronics Energy and Power Engineering Drawing Graphic Communications Metals Technology Woods Technology
	Personal Enrichment	General Industrial Arts Industrial Crafts

TABLE 2

VIRGINIA INDUSTRIAL ARTS

ENGINEERING DRAWING

COURSE DESCRIPTION:

Engineering Drawing provides students the opportunity to experience the graphic language of industry for engineers, manufacturers and technicians. It provides experiences with greater depth in drawing problems, skills and techniques. Emphasis is placed on interpretation of industrial prints, ability to use handbooks with other resource materials and adherence to established standards for drafting. An important aspect of the course is the application of drafting principles to typical engineering drawing and design problems.

COURSE GOALS:

Experiences and activities of this INDUSTRIAL ARTS course will enable the student to:

1.1 narrate and apply the processes of design.

1.2 recognize the principles of good design in commercial and student designed products.

1.3 realistically conceive a specific occupational opportunity and renumeration relative to career goals.

1.4 determine the value and advantages of various types of drawing equipment pertinent to engineering drawing.

2.1 practice efficient and safe use of equipment and materials commonly used in design-drafting related occupations.

2.2 prepare sets of working drawings that include detail drawings, assembly drawings and working drawings.

3.1 develop accurate value judgements of the types and amounts of training required for various job entry levels.

3.2 utilize resource and reference materials essential to major engineering drawing areas.

SUGGESTED TOPICAL OUTLINE:

I. Introduction to Engineering Drawing

II. Precision Dimensions

III. Threads and Fasteners

IV. Working Drawings

V. Revolutions

VI. Intersections and Developments

VII. Shop Processes

VIII. Cams and Gears

IX. Techniques of Design

X. The Industrial Arts Student Association

TASK # 1

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Introduction to Engineering Drawing

TASK: Demonstrate a Knowledge of the Historical Significance of Engineering Drawing.

CRITERION REFERENCED MEASURE: Discuss the historical significance of engineering drawing.

PERFORMANCE GUIDES:

1. Read assignment on the history of drawing.
2. Research the topic of engineering drawing.
3. Participate in class discussion on the historical significance of engineering drawing.

TASK # 2

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Introduction to Engineering Drawing

TASK: List the Career Opportunities and Trends in the Field of Engineering Drafting.

CRITERION REFERENCED MEASURE: Develop a list of career opportunities and trends in the field of engineering drafting including types of jobs, salaries, education required, and location of employment.

PERFORMANCE GUIDES:

1. Research the different career opportunities in the field of engineering drafting.
2. List the career opportunities available in the field of engineer drawing.
3. List the trends in the field of engineer drafting.
4. View an audio visual and/or field trip to an engineering firm.

TASK # 3

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Precision Dimensions

TASK: Explain the Purposes of Dimensioning in Relation to a Working Drawing.

CRITERION REFERENCED MEASURE: List and discuss the purposes of dimensioning in relation to a working drawing including showing overall size, detail, and location.

PERFORMANCE GUIDES:

1. Read assignment on dimensioning.
2. Participate in class discussion on dimensioning.
3. List the purposes for dimensioning working drawings.

TASK # 4

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Precision Dimensions

TASK: Develop Skills in Dimensioning Working Drawings by Following the Recommendations from the American National Standards Institute (ANSI).

CRITERION REFERENCED MEASURE: Make a working drawing and dimension it according to the American National Standards.

PERFORMANCE GUIDES:

1. Review dimensioning including:
   a. Systems of dimensioning,
   b. Specifications of lines and notes for dimensioning, and
   c. Specifications and placement of dimension.
2. Read assignment on dimensioning.
3. Demonstrate the proper dimensioning of a working drawing.
4. Complete selected assignments on dimensioning.

TASK # 5

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Threads and Fasteners

TASK: Explain the Function of Mechanical Fasteners.

CRITERION REFERENCED MEASURE: List and describe the function of each of the following mechanical fasteners: rivets, nails, threaded fasteners (screws, bolts and nuts), pins, and clamps.

PERFORMANCE GUIDES:

1. Read assignments on fasteners.
2. Participate in class discussion on mechanical fasteners.
3. List the uses of the different mechanical fasteners used in industrial processes.
4. Collect a variety of mechanical fasteners.

TASK # 6

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Threads and Fasteners

TASK: List the Different Forms and Series of Screw-Threads.

CRITERION REFERENCED MEASURE: List the different forms and series of screw threads: Forms - American Standard Threads "The American National Threads Forms", and Unified Standard Threads Forms and Series - Unified National Coarse, Unified National Fine, Unified National Extra-Fine Threads, and Unified National Uniform (Constant) Pitch Threads.

PERFORMANCE GUIDES:

1. Select and identify the different forms and series of screw-threads.
2. Read assignment on screw-threads.
3. Participate in class discussion on forms and series of screw-threads.
4. Examine various types of labeled screw-threads.

TASK # 7

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Threads and Fasteners

TASK: Develop Skills in Drawing and Dimensioning Simplified, Schematic, and Detailed Representations of Screw-Threads.

CRITERION REFERENCED MEASURE: Draw and dimension simplified, schematic, and detailed representations of screw-threads from selected models.

PERFORMANCE GUIDES:

1. Read assignment on simplified, schematic, and detailed representations of screw-threads.
2. Review the basic terminology of external and internal threads.
3. Demonstrate the proper drawing and dimensioning of simplified, schematic, and detailed representations of screw-threads through selected assignments.

TASK # 8

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Working Drawings

TASK: Discuss the Purpose of a Working Drawing.

CRITERION REFERENCED MEASURE: List the purpose of making working drawings as giving all the necessary shop information for the production of industrial pieces.

PERFORMANCE GUIDES:

1. Read assignments on working drawings.
2. Review existing working drawings.
3. Participate in class discussion on working drawings.
4. List the characteristics that make up a working drawing.

TASK # 9

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Working Drawings

TASK: Develop Skills in Making Detailed Working Drawings.

CRITERION REFERENCED MEASURE: Draw detailed working drawings including assembly drawings from selected models.

PERFORMANCE GUIDES:

1. Read the assignment on working drawings.
2. Participate in class discussion on drawing working drawings.
3. Select the specific views which describe the model.
4. Select sizes and related information to produce the model.
5. Draw a working drawing of the model.

TASK # 10

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Revolutions

TASK: Explain the Purpose of Revolutions.

CRITERION REFERENCED MEASURE: List and discuss the purpose of revolution drawings as a means of showing the true shape of the cross section of some elongated object (arm, spoke, or rib).

PERFORMANCE GUIDES:

1. Read the assignment on revolution drawings.
2. Observe demonstration on drawing revolutions.
3. Review examples of the draftsman's use of revolutions in industrial applications.

TASK # 11

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Revolutions

TASK: Develop Skills in Drawing Revolutions.

CRITERION REFERENCED MEASURE: Draw revolution drawings from selected models: axis perpendicular to horizontal, vertical and profile.

PERFORMANCE GUIDES:

1. Read assignments on revolutions.
2. Select the appropriate revolution to use in drawings.
3. Draw the true shape of the selected models using the revolution method.

TASK # 12

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Developments

TASK: Explain the Purposes of Drawing Developments and Intersections.

CRITERION REFERENCED MEASURE: Discuss the purpose of developments and intersections including furnishing the necessary information for making a pattern to facilitate the cutting and shaping of a material and finding the line of intersection between surfaces.

PERFORMANCE GUIDES:

1. Read assignment on developments and intersections.
2. Participate in class discussion on developments and intersections.
3. Observe demonstrations on drawing developments and intersections.
4. Develop a list of applications for using developments and intersections.
5. Define developments and intersections.
6. Observe drawings of developments and intersections.

TASK # 13

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Developments

TASK: Develop Skills in Drawing Intersections and Developments.

CRITERION REFERENCED MEASURE: Draw intersections and developments from selected models.

PERFORMANCE GUIDES:

1. Read assignments on intersections.
2. Observe demonstrations on intersections.
3. Select appropriate models. Draw the intersections of some of the following:
   a. intersection of two prisms at right angles to each other.
   b. intersection of two prisms oblique to each other.
   c. intersection of two cylinders at right angles.
   d. development of intersecting cylinders.
   e. intersection of two cylinders oblique to each other.
   f. intersection of a prism and a cylinder.
   g. cutting planes on cones.
   h. intersection of a cone and cylinder using radial lines.

TASK # 14

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Cams and Gears

TASK: Explain the Purposes of Gears and Cams that are used in Industrial Applications.

CRITERION REFERENCED MEASURE: Discuss the industrial applications of gears and cams as mechanisms that provide for rotary and oscillating motion in machines.

PERFORMANCE GUIDES:

1. Read assignments on gears and cams.
2. Participate in class discussion on gears and cams.
3. Develop a list of industrial applications for gears and cams.
4. Observe gears and cams in use.
5. View drawings of gears and cams.

TASK # 15

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Cams and Gears

TASK: Develop Skills in Drawing Cams.

CRITERION REFERENCED MEASURE: Draw cams from selected models.

PERFORMANCE GUIDES:

1. Study the data on cams:
    a. displacement diagrams
    b. uniform motion
    c. harmonic motion
    d. uniform accelerated and deceleration motion
    e. dwell
    f. displacement diagrams with a combination of motions
3. Select the appropriate cam model.
4. Draw the cam model.

TASK # 16

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Cams and Gears

TASK: Develop Working Drawings of Gears.

CRITERION REFERENCED MEASURE: Draw gears from selected models.

PERFORMANCE GUIDES:

1. Review general practices and terms for making gear drawings.
2. Review the data on gears.
3. Select the appropriate gear model.
4. Draw a working drawing of a gear.

TASK # 17

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: Techniques of Design

TASK: Develop Skill in Designing and Drawing Mechanisms.

CRITERION REFERENCED MEASURE: Design and Draw a Technical Mechanism.

PERFORMANCE GUIDES:

1. Observe drawings of functional machine parts.
2. Design a set of drawings representing a functional mechanism.
3. Draw the complete set of drawings to represent a functional mechanism.

TASK # A.I.A.S.A.

AREA OF COMPETENCE: Engineering Drawing

CONTENT/CONCEPT: In Class Industrial Arts Student Association.

TASK: Participation (involvement) in a democratic organization with activities using course content.

CRITERION REFERENCED MEASURE: Participate with other students in organized activities using industrial resources, leadership or followership, service or enterprise projects and recognition for workmanship.

PERFORMANCE GUIDES:

1. Organize class into personnel system for democratic decision making and leader/follower development.
2. Invite speakers to class and use resources of industry and technology from the community.
3. Carry out worthy group activities and projects to improve or serve school or community.
4. Operate an enterprise system to produce item of economic value.
5. Encourage competition in areas of course to motivate and recognize achievement.

NOTE: These performance guides are expanded in the publication titled Student Association Activities in Industrial Arts Instruction available from the Industrial Arts Service, Virginia Department of Education, Richmond, Virginia 23216.

A CATALOG OF TASKS
FOR
COMPETENCY-BASED INSTRUCTION
IN

Architectural Drawing

VIRGINIA
INDUSTRIAL ARTS

Industrial Arts Education Service
Department of Education
Commonwealth of Virginia
Richmond, Virginia 23216
1979

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Was Prepared At
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INTRODUCTION

In the summer of 1977, The Industrial Arts Curriculum K-12 was introduced. This plan outlined the preferred courses, course sequences, and purposes which should be addressed in Virginia industrial arts programs. However, the model curriculum plan did not establish exact knowledge, skills, and attitudes which all learners should possess as they exit particular programs.

The purpose of the following competency catalog of tasks is to establish a basis for program content selection and criterion levels from which one may measure to see if individual learners have achieved a minimal level of competence through study in a particular course. In this manner a means to improve education and its accountability to citizenry can be designed based upon the identification and attainment of prespecified outcomes for the industrial arts content area. Although this catalog is designed and presented in a sequencial order of task statements, it does not mean that it must be structured into local programs in this order. Individual instructors may choose to restructure the sequence of competency tasks to meet local needs.

In preparing this catalog considerable research and validation was undertaken to specify those minimal tasks which every learner enrolling in the course should be able to perform. The format of this and other catalogs includes the following areas: area of competence, content/concept, task, criterion referenced measure, and performance guides. The area of competence identifies the industrial arts course for which the particular task was prepared. Content/concept identifies the sub-area with which the particular task is associated. The task is the knowledge, skills or attitudes which the learner should possess after instruction in the industrial arts class. Criterion references measures are means to identify if the learner can successfully perform the stated task and finally, performance guides are sub-tasks which lead to the development of the knowledge, skills and attitudes

identified in the tasks. These areas are illustrated in Table 1. It should be noted that performance objectives have been omitted from the catalogs of tasks. This was done to allow individual instructors to develop objectives they see necessary to meet the local learning environment.

In Table 2 is identified the location of this course in the total program of industrial arts for Virginia. Other competency catalogs are contained in this publication and the remaining catalogs may be obtained from the Industrial Arts Education Service, Division of Vocational Education, Department of Education, P.O. Box 6Q, Richmond, Virginia 23216.

FORMAT DESCRIPTION

AREA OF COMPETENCE: Identifies the industrial arts course for which the particular task was prepared.

CONTENT CONCEPT: Identifies the sub-area which the particular task is associated.

TASK: Identifies the knowledge, skills, or attitudes which the learner should possess after completing instruction in the industrial arts class.

CRITERION REFERENCED MEASURE: The means to identify if the learner can successfully perform the stated task.

PERFORMANCE GUIDES: Identifies sub-tasks which lead to the development of the knowledge, skills, and attitudes identified in the tasks.

TABLE 1

The Industrial Arts Curriculum

Level	Goal	Program
Elementary School	Learning Reinforcement	Industrial Arts activities integrated within the elementary curriculum
Middle or Junior High School	Orientation and Exploration	Exploring Technology Modern Industry Construction Manufacturing
High School	Technical	Communication Technology Materials and Processes Technology Power and Transportation Technology Architectural Drawing Basic Technical Drawing Electricity and Electronics Energy and Power Engineering Drawing Graphic Communications Metals Technology Woods Technology
	Personal Enrichment	General Industrial Arts Industrial Crafts

TABLE 2

ARCHITECTURAL DRAWING

COURSE DESCRIPTION:

Architectural Drawing provides students the opportunity to learn more about the principles of architecture and the related drafting practices and techniques. It provides information helpful for the homeowner and is especially beneficial to the future architect, interior designer or home builder.

COURSE GOALS:

Experiences and activities of this INDUSTRIAL ARTS course will enable the student to:

1.1 narrate and apply the processes of architectural design.

1.2 recognize the principles of good design in commercial and student designed buildings.

1.3 realistically conceive a special occupational opportunity and renumeration relative to career goals.

1.4 determine the value and advantages of various types of drawing equipment pertinent to architectural drawing.

1.5 utilize resource and reference materials essential to major architectural drawing areas.

2.1 practice efficient and safe use of equipment and materials commonly used in design related occupations.

2.2 prepare sets of architectural drawings that include floor plans, cross detail sections, elevations, perspectives, electrical plans, plumbing plans, schedules and specifications.

3.1 develop accurate value judgements of the types an amounts of training required for various job entr levels.

SUGGESTED TOPICAL OUTLINE:

I. Introduction to Architectural Drawing

II. Planning the House

III. Basic Architectural Drawing

IV. Schedules and Specifications

V. Electrical Plans

VI. Heating and Air Conditioning

VII. Plumbing

VIII. Estimating and Financing

IX. Commercial Architecture (Optional)

X. Model House Construction (Optional)

XI. The Industrial Arts Student Association

TASK # 1

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Introduction to Architectural Drawing

TASK: Define Architectural Drawing.

CRITERION REFERENCED MEASURE: Define architectural drawing as the visual language used by draftsmen (architects) who work with physical structures.

PERFORMANCE GUIDES:

1. Read assignments on architectural drawing.
2. Define architectural drawings.

TASK # 2

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Introduction to Architectural Drawing

TASK: Discuss the Job Opportunities in Architecture.

CRITERION REFERENCED MEASURE: List the types of jobs available, the wages available, and the responsibilities involved with jobs in commercial, industrial, institutional, and naval architecture.

PERFORMANCE GUIDES:

1. Read assignments on the kinds of architectural drawing jobs available: commercial, industrial, institutional, and naval architecture.
2. Research jobs available in architectural drawing, wages for each job and the responsibilities associated with each.
3. Discuss job opportunities in architectural drawing in class.

TASK # 3

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Introduction to Architectural Drawing

TASK: Discuss the Qualifications for a Career in Architecture.

CRITERION REFERENCED MEASURE: Discuss the education, training, and experience background needed for a career in architecture.

PERFORMANCE GUIDES:

1. Read assignments on the education, training, and experience requirements for a career in architecture.
2. Discuss in class the qualifications needed to become an architect.

TASK # 4

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Introduction to Architectural Drawing

TASK: Develop Skills in using Mechanical Means of Lettering for Preparing Title Blocks and Logos.

CRITERION REFERENCED MEASURE: By mechanical means of lettering, letter title boxes and logos using lettering guides, lettering sets, and dry-transfer letters.

PERFORMANCE GUIDES:

1. Read instructions on how to use a lettering guide, lettering set, and dry-transfer letters.
2. Observe demonstrations on the use of lettering guides, lettering sets, and dry-transfer letters.
3. Letter drawings using lettering guides, lettering sets and dry-transfer letters.
4. Draw title blocks on all drawings and letter using mechanical means.

TASK # 5

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Introduction to Architectural Drawing

TASK: Develop Skills in Using Architectural Terminology.

CRITERION REFERENCED MEASURE: Describe the following standard architectural terms: commercial, industrial, institutional, slope, lot, building codes, surveys, zoning, wall section, schedules and specifications, and perspectives.

PERFORMANCE GUIDES:

1. **Read assignments and study architectural terms.**
2. **Observe examples of architectural drawings.**
3. **Use architectural terms where necessary on all architectural drawings.**

TASK # 6

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Introduction to Architectural Drawing

TASK: Discuss the Factors the Architect must Consider before Planning a House.

CRITERION REFERENCED MEASURE: Describe the factors that an architect must consider before planning a home including kinds of rooms, size of the family, hobbies of the family, likes and dislikes, style of home, lot it will be built upon, slope of the lot and type of neighborhood, weather conditions, sun position, building codes, trends in style, construction methods, and money available.

PERFORMANCE GUIDES:

1. Read assignments on factors to consider when planning a home.
2. List the kinds of rooms, size of family, hobbies of the family, style of home, type of lot and neighborhood, and approximate cost of an existing house.
3. Consider how each factor relates to the placement of house and rooms in the house.
4. Discuss in class why the above factors need to be considered before planning a home.

TASK # 7

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Planning the House

TASK: Discuss Zoning Regulations.

CRITERION REFERENCED MEASURE: List and explain the residential zoning regulations in the local area - surveys, deeds, ordinances, zoning regulations and building codes.

PERFORMANCE GUIDES:

1. Review the local residential zoning regulations.
2. Complete a local building permit.
3. Read the assignments on residential zoning.
4. Collect information for a set of residential house plans according to the local zoning regulations.

TASK # 8

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Basic Architectural Drawing

TASK: Develop Skills in Using Architectural Symbols.

CRITERION REFERENCED MEASURE: Use all architectural symbols needed in drawing a residential home.

PERFORMANCE GUIDES:

1. Review the different symbols used in architectural drawings.
2. Demonstrate the use of proper architectural symbols on selected models.

TASK # 9

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Planning the House

TASK: Develop Skills in Designing Floor Plans.

CRITERION REFERENCED MEASURE: Develop skills in designing and drawing a floor plan.

PERFORMANCE GUIDES:

1. Define floor plan.
2. Read assignments on how to draw a floor plan.
3. List the components of a floor plan.
4. Observe examples of correctly drawn floor plans of a house.
5. Design a floor plan for a home.
6. Draw the floor plan.

TASK # 10

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Planning the House

TASK: Develop Skills in Planning Traffic Patterns in Residential Structures.

CRITERION REFERENCED MEASURE: Develop skills in analyzing traffic patterns in residential structures including kitchen and dining, bedroom and bath, and living and dining areas.

PERFORMANCE GUIDES:

1. Review existing floor plans for traffic flow patterns.
2. Read assignments on traffic patterns in residential structures.
3. Participate in class discussions on residential traffic patterns.
4. Draw a floor plan of a residential structure showing proper traffic patterns.

TASK # 11

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Planning the House

TASK: Develop Skills in Planning Stairs and Halls in a Residential Structure.

CRITERION REFERENCED MEASURE: Develop a working drawing of stairs and halls for a residential structure following the recommended building codes.

PERFORMANCE GUIDES:

1. Review the recommended standards for stairs and halls in residential structures.
2. Evaluate an existing residential structure plan as to its conformity to the recommended standards - stairs and halls.
3. Read assignment on stairs and halls.
4. List the various types of stair designs and the function of each.
5. List the stair parts.
6. Draw a section view of stairs.

TASK # 12

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Planning the House

TASK: Develop Skills in Designing Individual Rooms.

CRITERION REFERENCED MEASURE: Design individual rooms for a specific model including the factors the architect must consider before planning a house.

PERFORMANCE GUIDES:

1. Review existing house plans.
2. Participate in class discussion on room designs.
3. Read assignment on planning a residential home.
4. Draw individual rooms for a specific model.

TASK # 13

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Planning the House

TASK: List the Components of a Wall Section of a Residential Structure.

CRITERION REFERENCED MEASURE: Identify and list the following components of a wall section of a residential structure - foundation, sill, joists, studs, subfloor, headers, bottom plate, top plate, double plate, rafters, gussets and ridge board.

PERFORMANCE GUIDES:

1. Read assignment on residential structures.
2. Review various types of residential structure drawings.
3. Observe the construction of a residential structure.
4. Draw a wall section of a residential structure.
5. Label a wall section drawing.
6. Construct a model of a wall section.

TASK # 14

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Planning the House

TASK: List the Basic Types of Houses.

CRITERION REFERENCED MEASURE: List and identify the basic types, shapes and styles of residential homes including one-story, one and one-half story, two-story, split-level, square, rectangle, L, U and T variations.

PERFORMANCE GUIDES:

1. Read assignment on types, shapes and styles of houses.
2. Participate in class discussions on types and shapes of houses.
3. List the advantages and disadvantages of each typical house shape and style.
4. Draw a floor plan of a basic type house.

TASK # 15

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Basic Architectural Drawing

TASK: Develop Skill in Making Perspective Drawings.

CRITERION REFERENCED MEASURE: Demonstrate skill in drawing a two-point perspective of a home.

PERFORMANCE GUIDES:

1. Read assignments on perspective drawings.
2. View drawings of perspective drawings.
3. Draw two-point perspective drawings.

TASK # 16

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Planning the House

TASK: Discuss the Affects of Wind, Sun, Natural Surroundings, and Altitude on a House Design.

CRITERION REFERENCED MEASURE: List basic factors that must be considered when planning a house including plot, plans, contour plans, prevailing winds, the view and privacy, sun altitude and position of the house.

PERFORMANCE GUIDES:

1. Read assignments on planning a house.
2. Study a house deed and look for restrictions and report to class.
3. Participate in class discussion on external factors that affect a house design.

TASK # 17

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Basic Architectural Drawing

TASK: Develop Skills in Drawing Detailed Sections of a House Plan.

CRITERION REFERENCED MEASURE: Draw a Detailed Section of a House Plan.

PERFORMANCE GUIDES:

1. Review detailed section plans of houses.
2. Read assignment on drawing building sections.
3. Participate in class discussion on drawing building sections.
4. Select and draw detailed section of a house plan.

TASK # 18

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Basic Architectural Drawing

TASK: Develop Skills in Drawing Elevations.

CRITERION REFERENCED MEASURE: Draw a House Plan Showing all Exterior wall surfaces.

PERFORMANCE GUIDES:

1. Read assignment on drawing exterior elevations.
2. Review basic house elevation drawings.
3. Participate in class discussions on exterior elevation.
4. Review procedures used in drawing elevations.
5. Select and draw a house elevation plan.

TASK # 19

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Basic Architectural Drawing

TASK: Develop Skills in Drawing Foundation Plans.

CRITERION REFERENCED MEASURE: Draw a footing and foundation plan of a house following established standards.

PERFORMANCE GUIDES:

1. Discuss the terms footing and foundation as they relate to homes.
2. Discuss FHA minimum requirements for foundation thickness.
3. Review building codes.
4. Visit a construction site to observe procedures used in building footers and foundations.
5. Read assignment on footers and foundation plans.
6. Review different foundation drawings.
7. Draw a sectional footing/foundation.

TASK # 20

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Basic Architectural Drawing

TASK: Develop Skills in Developing Window and Door Schedules for a Residential Home.

CRITERION REFERENCED MEASURE: Develop window and door schedules for a residential home.

PERFORMANCE GUIDES:

1. Read assignment on window and door schedules.
2. Review existing window and door schedules.
3. Review technical data.
4. Select appropriate window and door schedule data.
5. Develop window and door schedules for a specific model.

TASK # 21

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Schedules And Specifications

TASK: Develop Skills in Using Reference Catalogs Associated with Architectural Standards.

CRITERION REFERENCED MEASURE: Select and use the proper architectural reference catalogs in developing a set of schedules and specifications for a house plan.

PERFORMANCE GUIDES:

1. Review the names of the prominent architectural catalogs.
2. Develop bibliographical list of reference catalogs.
3. Visit an architectural firm and list the different reference catalogs.
4. Demonstrate the correct usage of the catalogs.

TASK # 22

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Schedules and Specifications

TASK: Conduct a Complete Set of Specifications and Schedules for a Residential House.

CRITERION REFERENCED MEASURE: Develop and construct a complete set of specifications and schedules for a residential house.

PERFORMANCE GUIDES:

1. Discuss how to identify and use codes, letters and figures in regards to schedules.
2. Review existing specifications for houses.
3. Discuss where specification and schedule information can be obtained.
4. Read assignments on specifications and schedules.
5. Visit architectural firms to observe how they develop schedules and write specifications.
6. Develop a complete set of specifications and schedules for a residential house.

TASK # 23

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Electrical Plans

TASK: Develop Skills in General Planning for the Electrical Systems in Residential Homes.

CRITERION REFERENCED MEASURE: Develop a list of general requirements for residential homes including distribution, wires and circuits, lighting outlets, and switches and special outlet requirements.

PERFORMANCE GUIDES:

1. Read assignments on electrical requirements.
2. Check the local, state and federal electrical codes.
3. List and explain the basic units of measurement for electricity.
4. Participate in class discussion on electrical regulations and requirements for residential homes.

TASK # 24

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Electrical Plans

TASK: Develop Skills in Drawing Electrical Floor Plans for Residential Homes.

CRITERION REFERENCED MEASURE: Plan and draw an electrical floor plan of a residential home.

PERFORMANCE GUIDES:

1. Review the symbols used in electrical residential home building floor plans.
2. Review existing electrical floor plans.
3. Review electrical specifications.
4. Review electrical codes.
5. Read assignments on electrical floor plans for residential homes.
6. Select and draw an electrical floor plan for a residential home.

TASK # 25

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Heating and Air Conditioning

TASK: Describe the Necessary Ingredients for Adequate Climate Control in a Residential Home.

CRITERION REFERENCED MEASURE: List and describe the ingredients for climate control in a residential home including heat distribution methods, air conditioning and humidity control.

PERFORMANCE GUIDES:

1. Read assignment on climate control.
2. Review FHA specifications on climate control.
3. Review specifications on different heating, air conditioning and humidifying units.
4. Participate in class discussion on climate control.

TASK # 26

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Heating and Air Conditioning

TASK: Explain how Geographic Locations Affect the Choice of Heating and Air Conditioning that Should be Installed in Residential Homes.

CRITERION REFERENCED MEASURE: List and discuss the factors that must be taken into consideration when installing heating and air conditioning in a residential home in certain geographic locations in the United States including prevailing winds, altitude, temperature, seasons, building site, orientation of the house and the sun in relation to the orientation of the house.

PERFORMANCE GUIDES:

1. Review historical weather statistics.
2. Review regional wind charts.
3. Determine the position of the house based upon calculations of altitude and azimuth angles.
4. Read assignments on house planning.
5. Participate in class discussions on heating and air conditioning as it relates to specific geographical locations.
6. Research new methods of heating and cooling a residential home.

TASK # 27

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Heating and Air Conditioning/ Alternate Energy

TASK: Design a House that Would take into Consideration the use of Solar Energy as a Heat Source.

CRITERION REFERENCED MEASURE: Plan and draw a house that uses solar energy as its main source of heating.

PERFORMANCE GUIDES:

1. Research the topic solar energy as a primary heat source.
2. Review existing house plans that utilize solar energy as a heat source.
3. List the factors that must be considered when using solar energy as a heat source.

TASK # 28

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Estimating and Financing

TASK: Discuss the Different Methods of Financing Residential Homes.

CRITERION REFERENCED MEASURE: List and describe the methods of financing residential homes: mortgage (FHA, VA, conventional, and land contrast) and trade-in houses.

PERFORMANCE GUIDES:

1. Read assignment on home financing.
2. Participate in class discussion on financing a residential home.

TASK # 29

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Estimating and Financing

TASK: Describe the Procedures in Building the Residential Home.

CRITERION REFERENCED MEASURE: List and describe the steps in getting the residential home built including plans and specifications, getting land, select contractor, and financing.

PERFORMANCE GUIDES:

1. Read assignment on planning a residential home.
2. Participate in class discussions on home building.
3. Develop a list of criteria that should be followed in planning a residential home.

TASK # 30

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Estimating and Financing

TASK: Explain Estimating as it Relates to Building Construction.

CRITERION REFERENCED MEASURE: List and describe the major factors that must be considered when estimating building construction including materials and cost, construction methods and labor costs.

PERFORMANCE GUIDES:

1. Read assignments on estimating.
2. Review the different methods of estimating costs - square foot and cubic foot.
3. Review existing materials and labor estimating sheets.
4. Discuss in class the topic of estimating.

TASK # 31

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Estimating and Financing

TASK: Explain Estimating as it Relates to Building Construction.

CRITERION REFERENCED MEASURE: List and describe the major factors that must be considered when estimating building construction including materials and cost, construction methods and labor costs.

PERFORMANCE GUIDES:

1. Read assignments on estimating.
2. Review the different methods of estimating costs - square foot and cubic foot.
3. Review existing materials and labor estimating sheets.
4. Discuss in class the topic of estimating.

TASK # 32

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: Basic Architectural Drawing

TASK: Develop Skills in Drawing a Complete Set of House and Plot Plans.

CRITERION REFERENCED MEASURE: Draw a complete set of home plans with schedules and specifications for the plot, footing and foundation, basement (if needed), floor, and electrical plan of a house.

PERFORMANCE GUIDES:

1. Review existing house plans and specifications.
2. Review different drawings of house plans, schedules and specifications.
3. Participate in class discussions on the basic drawings needed to draw a complete house and plot plan.
4. Read assignment on drawing house and plot plans.
5. Develop a complete plot and house plans for a house of your own design.

TASK # A.I.A.S.A.

AREA OF COMPETENCE: Architectural Drawing

CONTENT/CONCEPT: In Class Industrial Arts Student Association

TASK: Participation (involvement) in a democratic organization with activities using course content.

CRITERION REFERENCED MEASURE: Participate with other students in organized activities using industrial resources, leadership or followership, service or enterprise projects and recognition for workmanship.

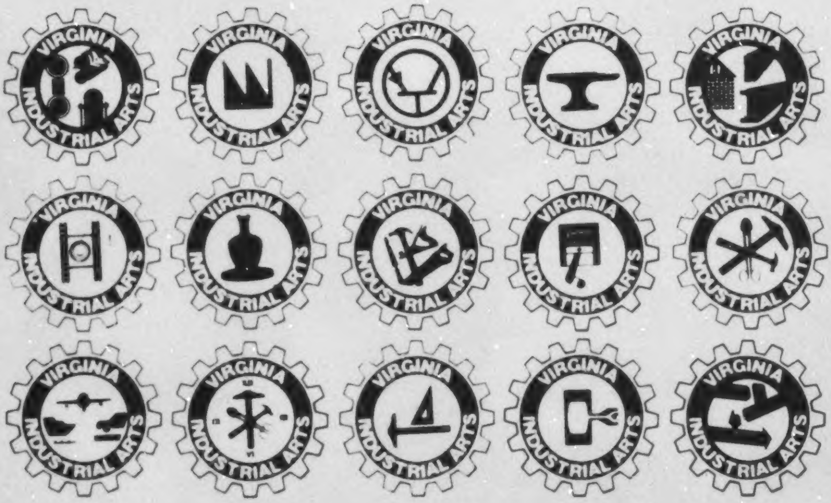
PERFORMANCE GUIDES:

1. Organize class into personnel system for democratic decision making and leader/follower development.
2. Invite speakers to class and use resources of industry and technology from the community.
3. Carry out worthy group activities and projects to improve or serve school or community.
4. Operate an enterprise system to produce item of economic value.
5. Encourage competition in areas of course to motivate and recognize achievement.

NOTE: These performance guides are expanded in the publication titled Student Association Activities in Industrial Arts Instruction available from the Industrial Arts Service, Virginia Department of Education, Richmond, Virginia 23216.

A CATALOG OF TASKS FOR COMPETENCY-BASED INSTRUCTION IN

Electricity/Electronics I & II


VIRGINIA
INDUSTRIAL ARTS

Industrial Arts Education Service
Department of Education
Commonwealth of Virginia
Richmond, Virginia 23216
1979

This Catalog of Tasks
Was Prepared At
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INTRODUCTION

In the summer of 1977, The Industrial Arts Curriculum K-12 was introduced. This plan outlined the preferred courses, course sequences, and purposes which should be addressed in Virginia industrial arts programs. However, the model curriculum plan did not establish exact knowledge, skills, and attitudes which all learners should possess as they exit particular programs.

The purpose of the following competency catalog of tasks is to establish a basis for program content selection and criterion levels from which one may measure to see if individual learners have achieved a minimal level of competence through study in a particular course. In this manner a means to improve education and its accountability to citizenry can be designed based upon the identification and attainment of prespecified outcomes for the industrial arts content area. Although this catalog is designed and presented in a sequencial order of task statements, it does not mean that it must be structured into local programs in this order. Individual instructors may choose to restructure the sequence of competency tasks to meet local needs.

In preparing this catalog considerable research and validation was undertaken to specify those minimal tasks which every learner enrolling in the course should be able to perform. The format of this and other catalogs includes the following areas: area of competence, content/concept, task, criterion referenced measure, and performance guides. The area of competence identifies the industrial arts course for which the particular task was prepared. Content/concept identifies the sub-area with which the particular task is associated. The task is the knowledge, skills or attitudes which the learner should possess after instruction in the industrial arts class. Criterion references measures are means to identify if the learner can successfully perform the stated task and finally, performance guides are sub-tasks which lead to the development of the knowledge, skills and attitudes

identified in the tasks. These areas are illustrated in Table 1. It should be noted that performance objectives have been omitted from the catalogs of tasks. This was done to allow individual instructors to develop objectives they see necessary to meet the local learning environment.

In Table 2 is identified the location of this course in the total program of industrial arts for Virginia. Other competency catalogs are contained in this publication and the remaining catalogs may be obtained from the Industrial Arts Education Service, Division of Vocational Education, Department of Education, P.O. Box 6Q, Richmond, Virginia 23216.

FORMAT DESCRIPTION

AREA OF COMPETENCE: Identifies the industrial arts course for which the particular task was prepared.

CONTENT/CONCEPT: Identifies the sub-area which the particular task is associated.

TASK: Identifies the knowledge, skills, or attitudes which the learner should possess after completing instruction in the industrial arts class.

CRITERION REFERENCED MEASURE: The means to identify if the learner can successfully perform the stated task.

PERFORMANCE GUIDES: Identifies sub-tasks which lead to the development of the knowledge, skills, and attitudes identified in the tasks.

TABLE 1

The Industrial Arts Curriculum

Level	Goal	Program
Elementary School	Learning Reinforcement	Industrial Arts activities integrated within the elementary curriculum
Middle or Junior High School	Orientation and Exploration	Exploring Technology Modern Industry Construction Manufacturing
High School	Technical	Communication Technology Materials and Processes Technology Power and Transportation Technology Architectural Drawing Basic Technical Drawing Electricity and Electronics Energy and Power Engineering Drawing Graphic Communications Metals Technology Woods Technology
	Personal Enrichment	General Industrial Arts Industrial Crafts

TABLE 2

ELECTRICITY/ELECTRONICS I

COURSE DESCRIPTION:

Students experiment with simple electrical devices and circuits. Projects are built using DC and AC devices and circuits.

COURSE GOALS:

Experiences and activities of this INDUSTRIAL ARTS course will enable the student to:

1.1 recall and use electricity/electronics terms in conversation and writing.

1.2 demonstrate in class the skills and techniques useful for general maintenance of electrical devices.

1.3 be familiar with the use of basic componenets in DC and AC circuits.

2.1 operate basic test and measuring devices used in electrical circuits.

2.2 exhibit safe practices in working with electrical circuits and devices.

2.3 construct an electrical project utilizing DC and AC devices and circuits.

3.1 organize and list in order the criteria for choosing and buying electrical devices.

3.2 describe the importance of following regulations in the installation of electrical components.

SUGGESTED TOPICAL OUTLINE:

I. Introduction and Review

II. Test Instruments

III. Vacuum Tubes and Semiconductors

IV. Power Supplies

V. Electron Amplifiers

VI. Electron Oscillators

VII. Radio Transmitters

VIII. Radio Receivers

IX. Television

X. Integrated Circuits

XI. Career Opportunities

XII. Electronics in Industry and Society

XIII. The Industrial Arts Student Association

TASK # 1

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: The Science of Electronics

TASK: Explain the Application of Electricity/Electronics

CRITERION REFERENCED MEASURE: Discuss the application of electricity/electronics as it relates to goods and services.

PERFORMANCE GUIDES:

1. Read assignment on science of electronics.
2. Participate in class discussion on electronics in the modern world.
3. Define electricity and electronics.

TASK # 2

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: The Science of Electronics

TASK: Describe the Law of Charges.

CRITERION REFERENCED MEASURE: Explain why like charges repel, and unlike charges retract.

PERFORMANCE GUIDES:

1. Observe demonstration on the law of charges.
2. Perform experiment on law of charges.
3. Participate in class discussion on static electricity.
4. Perform selected experiments in static electricity.

TASK # 3

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: The Science of Electronics

TASK: Explain the Direction of Current Flow.

CRITERION REFERENCED MEASURE: Explain and illustrate the direction of current flow.

PERFORMANCE GUIDES:

1. Read assignment on science of electronics.
2. Participate in class discussion on current flow.
3. Determine the direct current flow in a schematic diagram.
4. Perform selected experiment on electricity/electronic circuits measuring current.

TASK # 4

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: The Science of Electronics

TASK: Explain the Difference between Conductor and Insulator.

CRITERION REFERENCED MEASURE: Differentiate between electrical conductor and insulator using samples and test equipment furnished by the instructor.

PERFORMANCE GUIDES:

1. Read assignment on science of electronics.
2. Participate in class discussion on conductors and insulators.
3. Develop a list of conductors and insulators.
4. Explain the characteristics of conductors and insulators.
5. Correctly identify items as conductor or non-conductor by experiments.

TASK # 5

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: The Science of Electronics

TASK: Develop an Awareness of Proper Safety Procedures to Follow when Working with Electricity/Electronics

CRITERION REFERENCED MEASURE: Demonstrate an awareness of proper safety procedures to follow when working with electricity/electronics.

PERFORMANCE GUIDES:

1. Wear the proper eye protection.
2. Report any equipment that does not work.
3. Report all accidents.
4. Wipe up spilled liquids.
5. Check with the instructor on use of equipment.
6. Develop a receptive attitude toward safety.

TASK # 6

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Sources of Electricity

TASK: Describe the Different Sources of Electricity.

CRITERION REFERENCED MEASURE: Describe the different sources of electricity such as:
friction
light
heat
pressure
magnetism and
chemical.

PERFORMANCE GUIDES:

1. Read assignment on sources of electricity.
2. Research the different sources of electricity and list their consumer application.
3. Participate in class discussion on sources of electricity.
4. Perform selected experiments on producing electricity by:
   light,
   heat,
   pressure,
   magnetism,
   friction, and
   chemical means.

TASK # 7

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Sources of Electticity

TASK: List the Different Types of Primary Cells and Their Application.

CRITERION REFERENCED MEASURE: Develop a list of different types of primary cells and their application including mercury cell, alkaline cell, nickel-cadmium cell, fuel cell, carbon-zinc cell, and lead-acid cell.

PERFORMANCE GUIDES:

1. Read assignment on sources of electricity.
2. Participate in class discussion on different types of primary cells and their applications.
3. List the characteristics of the different types of primary cells.
4. Research the application of each of the primary cells.
5. Perform selected experiments with different types of primary cells.

TASK # 8

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Sources of Electricity

TASK: Differentiate Between a Primary and Secondary Cell.

CRITERION REFERENCED MEASURE: Explain the difference between a primary and secondary cell.

PERFORMANCE GUIDES:

1. Discuss the basic physical properties of a secondary cell.
2. Contrast the basic features of a primary cell to a secondary cell.
3. Participate in class discussion on secondary cells.
4. Perform selected experiments on secondary cells.

TASK # 9

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Sources of Electricity

TASK: Differentiate Between a Battery and a Cell.

CRITERION REFERENCED MEASURE: Discuss the difference between a battery and cell.

PERFORMANCE GUIDES:

1. Compare the physical characteristics of a battery and cell.
2. Perform selected experiment on connecting cells in series and parallel and measuring voltages.
3. Draw a schematic diagram of a cell and battery.
4. List the application for cells and batteries.

TASK # 10

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Circuits and Power

TASK: List the Component Parts of a Simple Circuit.

CRITERION REFERENCED MEASURE: Identify and describe the component parts of a simple circuit including source, conductor and load.

PERFORMANCE GUIDES:

1. Read assignments on components of a circuit.
2. Observe teacher presentation on simple circuits.
3. Experiment constructing simple circuits.
4. Make projects employing simple circuits.

TASK #11

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Circuits and Power

TASK: Develop Skills in Measuring Wire Size using the American Wire Gauge.

CRITERION REFERENCED MEASURE: Demonstrate skill in measuring wire size using the American Wire Gauge.

PERFORMANCE GUIDES:

1. Read assignment on conduction.
2. Observe demonstration on the use of the American Wire Gauge to measure the diameter of the wire.
3. Select different sizes and kinds of wire.
4. Demonstrate the proper procedure to use in measuring wire using the American Wire Gauge.

TASK # 12

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Circuits and Power

TASK: List the Factors that Determine the Resistance of Wire.

CRITERION REFERENCED MEASURE: List and describe the factors that determine the resistance of wire including length, size, temperature, and material.

PERFORMANCE GUIDES:

1. Participate in class discussion on the types of wire used in electricity/electronics.
2. Examine different types of wires used in electricity/electronics.
3. Review data tables for wire standards.
4. Perform selected experiments on resistance of wire.
5. Develop a list of factors that determine the resistance of wire used in electricity/electronics.

TASK # 13

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Circuits and Power

TASK: Describe the Different Types of Resistors and their Functions.

CRITERION REFERENCED MEASURE: List and describe the different types of resistors and their functions including wattage rating, type of composition, exterior markings, and general appearance.

PERFORMANCE GUIDES:

1. Read assignment on resistors.
2. Examine different types of resistors.
3. Participate in class discussion on resistors.
4. Develop a list of the different types of resistors based upon:
   a. wattage rating
   b. type of composition
   c. exterior markings
   d. general appearance

TASK # 14

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Circuits and Power

TASK: Develop Skills in Reading Color-Coded Resistors.

CRITERION REFERENCED MEASURE: Demonstrate skills in reading color-coded resistors.

PERFORMANCE GUIDES:

1. Review the resistor color code chart.
2. Observe demonstration on the steps to be followed in reading color code resistors.
3. Select resistors and read color code values and tolerance ratings.

TASK # 15

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Circuits and Power

TASK: Develop Skills in Measuring Resistance of Resistors.

CRITERION REFERENCED MEASURE: Demonstrate skills in measuring resistance of resistors using a VOM.

PERFORMANCE GUIDES:

1. Review procedures for measuring resistance with the VOM.
2. Measure the resistance of resistors using the VOM.
3. Verify the measured value with the stated marked values.

TASK # 16

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Circuits and Power

TASK: Verify Ohm's Law.

CRITERION REFERENCED MEASURE: Verify Ohm's Law using mathematical and mechanical means.

PERFORMANCE GUIDES:

1. Read assignment on Ohm's Law.
2. Observe demonstrations on Ohm's Law verification including:
   $E = I \times R$
   $R = \frac{E}{I}$, and
   $I = \frac{E}{R}$
3. Do selected problems verifying Ohm's Law.
4. Select appropriate components and construct a simple series and parallel circuits and use a VOM to measure voltage, current and resistance.
5. Use Ohm's Law to verify measured values.

TASK # 17

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Circuits and Power

TASK: Define Electrical Power.

CRITERION REFERENCED MEASURE: Define electrical power as voltage times current.

PERFORMANCE GUIDES:

1. Read assignment on electrical power.
2. Name the unit of electrical power.
3. Explain why electrical power is important.
4. Observe demonstration on calculation of power.
   $P = I \times E, \quad I = P/E, \quad E = P/I$
5. Give a definition of electrical power.

TASK # 18

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Circuits and Power

TASK: Develop Skills in Measuring DC Voltage, Current, and Resistance in Electronic Circuits.

CRITERION REFERENCED MEASURE: Demonstrate skill in measuring voltage, current, and resistance in the following electronic circuits: Series, Parallel, and Combination.

PERFORMANCE GUIDES:

1. Read assignments on series, parallel, and combination circuits.
2. Observe demonstrations on simple circuit construction following a schematic: Power supply and components.
3. Observe teacher demonstration on voltage (DC) current (DC) and resistance measurements using a VOM in a series, parallel and combination electronic circuits.
4. Participate in class discussion on circuit construction and measuring voltage, current, and resistance in electricity/electronic circuits.
5. Perform selected measurement experiments on series, parallel or combination electricity/electronic circuits.

TASK # 19

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Circuits and Power

TASK: Develop Skill in Preparing Printed Circuit Boards.

CRITERION REFERENCED MEASURE: Prepare a printed circuit board.

PERFORMANCE GUIDES:

1. Review symbols for electronic components.
2. Read assignment on printed circuits.
3. Review different printed circuit boards found in consumer products.
4. Observe teacher demonstration on preparing printed circuit boards.
5. Select the appropriate circuit and make a printed circuit.
    a. preparing the layout diagram
    b. cutting PC board to size
    c. apply resist
    d. etching
    e. drilling and tinning
    f. mounting of components
    g. soldering

TASK # 20

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Magnetism

TASK: Discuss the Laws of Magnetism.

CRITERION REFERENCED MEASURE: Explain the laws of magnetism as like poles repel each other and unlike poles attract each other.

PERFORMANCE GUIDES:

1. Read assignment on magnetism.
2. Observe teacher demonstration on magnetism using permanent magnets.
3. Participate in class discussion on magnetism and its properties.
4. Perform experiment on permanent magnets.

TASK # 21

AREA OF COMPETENCE: Electricity/Electronics

CONTENT/CONCEPT: Magnetism

TASK: Explain how an Electromagnet Operates.

CRITERION REFERENCED MEASURE: Describe the operation of an electromagnet.

PERFORMANCE GUIDES:

1. Observe teacher demonstration on electromagnets.
2. Participate in class discussion on electromagnets.
3. Perform experiment on electromagnets.

TASK # 22

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Magnetism

TASK: Describe How a Relay Operates.

CRITERION REFERENCED MEASURE: Explain how reed and electromagnetic relays operate.

PERFORMANCE GUIDES:

1. Observe teacher demonstration on electromagnetic relays.
2. Examine the physical characteristics of relays.
3. Participate in class discussion on relays.
4. Perform selected experiments using relays.

TASK # 23

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Generators/Motors

TASK: Explain the Generator Principles.

CRITERION REFERENCED MEASURE: Describe the Generator Principles for AC and DC generators.

PERFORMANCE GUIDES:

1. Read assignment on generators.
2. List the parts of a generator and describe the function of each.
3. Participate in class discussion on types of generators.
4. Perform selected experiments on generators: AC and DC.

TASK # 24

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Generators

TASK: Differentiate Between AC and DC Generators.

CRITERION REFERENCED MEASURE: Explain the difference between AC and DC generators.

PERFORMANCE GUIDES:

1. Compare the physical features of an AC generator to a DC generator.
2. Observe the voltage output from an AC and DC generator as demonstrated by the teacher.
3. Discuss the basic physical difference between an AC and DC generator.

TASK # 25

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Generators/Motors

TASK: Describe the Different Types of Motors.

CRITERION REFERENCED MEASURE: Describe the different types of motors including series DC motors, shunt DC motors, universal motors, and induction motors.

PERFORMANCE GUIDES:

1. Read assignment on electric motors.
2. Participate in class discussion on electrical motors.
3. Draw and label the basic parts of an electric motor.
4. Visually inspect different types of motors.
5. Observe demonstrations on the construction and operation of different motors.
6. Perform selected lab experiments on electrical motors.
7. List the different motors and describe their characteristics and uses.

TASK # 26

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Inductance and RL Circuits

TASK: Define Inductance.

CRITERION REFERENCED MEASURE: Define inductance as the property of a circuit that opposes any change in the amount of current.

PERFORMANCE GUIDES:

1. Read assignment on inductance.
2. Participate in class discussion on inductance.
3. Define inductance and its unit of measurement.
4. Review the different types of inductors.
5. Observe teacher demonstration on voltage and current readings in RL circuits: series and parallel.
6. List the uses of inductors in consumer products.
7. Perform selected DC and AC experiments on RL circuits: series and parallel.

TASK # 27

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Inductance and RL Circuits

TASK: Explain the Operation of a Transformer.

CRITERION REFERENCED MEASURE: Describe the operation of a transformer.

PERFORMANCE GUIDES:

1. Read assignment on transformers.
2. Do a sketch showing the transformer construction and label the major parts.
3. Select a transformer and measure voltage using the primary and secondary windings.
4. Review the different types of transformer construction.
5. Perform selected experiments on transformers.
6. Participate in class discussion on transformers.

TASK # 28

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Capacitance in Electrical Circuits.

TASK: Define Capacitance.

CRITERION REFERENCED MEASURE: Define capacitance as the property of a circuit that opposes any change in the amount of voltage.

PERFORMANCE GUIDES:

1. Read assignment on capacitance.
2. Participate in class discussion on capacitors.
3. Define capacitance and its unit of measurement.
4. Observe demonstration on voltage and current measurements in RC circuits: series and parallel.
5. List the uses of capacitors in consumer products.
6. Perform selected DC and AC experiments on RC circuits: series and parallel.

TASK # 29

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Capacitance in Electrical Circuits

TASK: Demonstrate an Understanding of the Physical Properties of Capacitors and their Ratings.

CRITERION REFERENCED MEASURE: Describe the physical properties of capacitors and their ratings.

PERFORMANCE GUIDES:

1. Review the different types of capacitors and list their physical characteristics.
2. Perform selected experiments on testing capacitors.
3. Review technical data on capacitors.
4. Participate in class discussion on capacitors.

TASK # 30

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: RCL Networks

TASK: Describe the Characteristics of an RCL Network.

CRITERION REFERENCED MEASURE: Explain the characteristics of an RCL network.

PERFORMANCE GUIDES:

1. Read assignment on RCL networks.
2. Participate in class discussion on RCL networks.
3. List the characteristics of an RCL network.

TASK # 31

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: RCL Networks

TASK: Describe Resonance in an RCL Circuit.

CRITERION REFERENCED MEASURE: Explain resonance in an RCL circuit.

PERFORMANCE GUIDES:

1. Define resonance.
2. Participate in class discussion on resonance.
3. Observe teacher demonstration on voltage, current and resistance measurement in RCL circuits: series and parallel.
4. Perform selected series and parallel experiments on RCL circuits.
5. Perform selected calculations for verification of voltage, current, resistance in RCL circuits.

TASK # 32

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Instruments and Measurements

TASK: Develop Skills in Using the Volt-Ohm-Milliampere (VOM)

CRITERION REFERENCED MEASURE: Demonstrate skills in using the VOM to measure voltage (AC and DC), current, and resistance.

PERFORMANCE GUIDES:

1. Participate in class discussion on the purpose of the VOM.
2. Observe teacher demonstration on the proper use of the VOM to measure voltage, current, and resistance.
3. Review technical manual on the VOM.
4. Demonstrate the proper way to set up a voltmeter:
   a. function selection switch
   b. range switch
   c. probe connection
5. Demonstrate how to connect a meter in a circuit with correct polarity.
6. Become familiar with various meter scales.
7. Perform experiments using the voltmeter, ohmmeter, and ammeter.

TASK # 33

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Instruments and Measurements

TASK: Develop Skill in Using a Power Supply.

CRITERION REFERENCED MEASURE: Properly use a power supply for a power source in electricity/electronic circuits.

PERFORMANCE GUIDES:

1. Read specifications and operational manual.
2. Observe teacher demonstration on the proper use of the power supply.
3. Correctly connect the power supply to selected electricity/electronic circuits.
4. Select the proper settings on the power supply for either AC or DC voltage.

TASK # 34

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Instruments and Measurements

TASK: Develop Skill in Using an Oscilloscope.

CRITERION REFERENCED MEASURE: Demonstrate skill in using an oscilloscope on electrical circuits.

PERFORMANCE GUIDES:

1. Review the technical data manual on the oscilloscope.
2. Observe teacher demonstration on the proper setup for observing waveforms measuring voltages.
3. Demonstrate the proper procedure that must be used when initially preparing the oscilloscope to observe and measure voltages.
4. Measure voltage in experimental and consumer electricity/electronic circuits using an oscilloscope.

TASK # 35

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Instruments and Measurements

TASK: Develop Skill in Using a Capacitor Checker.

CRITERION REFERENCED MEASURE: Demonstrate skill in using the capacitor checker on various capacitors.

PERFORMANCE GUIDES:

1. Review technical manual on the capacitor checker.
2. Participate in class discussion on the purpose of a capacitor checker.
3. Observe teacher demonstration on the proper use of the capacitor checker.
4. Become familiar with the setup procedure.
5. Demonstrate how to test capacitors on the capacitor checker.

TASK # 36

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Instruments and Measurements

TASK: Develop Skill in Using a Digital Multimeter.

CRITERION REFERENCED MEASURE: Develop skill in using a digital multimeter to measure voltage, current, and resistance in electricity/electronic circuits.

PERFORMANCE GUIDES:

1. Review technical manual on the multimeter.
2. Observe teacher demonstration on the proper use of the digital multimeter to measure voltage, current, and resistance in experimental and consumer products electronic circuits.
3. Demonstrate the proper way to set up a digital multimeter.
4. Use the digital multimeter to measure voltage, current and resistance in electricity/electronic circuits.

TASK # 37

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: Instruments and Measurements

TASK: Develop Skill in Using the Signal Generator.

CRITERION REFERENCED MEASURE: Demonstrate skill in using the signal generator.

PERFORMANCE GUIDES:

1. Review technical manual on the signal generator.
2. Participate in class discussion on the purpose and uses of the signal generator.
3. Observe teacher demonstration on the proper set-up procedures for using the signal generator.
4. Demonstrate the proper procedure used in setting up the signal generator.
5. Use the signal generator in selected experimental and consumer products electricity/ electronic circuits.

TASK # A.I.A.S.A.

AREA OF COMPETENCE: Electricity/Electronics I

CONTENT/CONCEPT: In Class Industrial Arts Student Association

TASK: Participation (involvement) in a democratic organization with activities using course content.

CRITERION REFERENCED MEASURE: Participate with other students in organized activities using industrial resources, leadership or followership, service or enterprise projects and recognition for workmanship.

PERFORMANCE GUIDES:

1. Organize class into personnel system for democratic decision making and leader/follower development.
2. Invite speakers to class and use resources of industry and technology from the community.
3. Carry out worthy group activities and projects to improve or serve school or community.
4. Operate an enterprise system to produce item of economic value.
5. Encourage competition in areas of course to motivate and recognize achievement.

NOTE: These performance guides are expanded in the publication titled Student Association Activities in Industrial Arts Instruction available from the Industrial Arts Service, Virginia Department of Education, Richmond, Virginia 23216.

VIRGINIA INDUSTRIAL ARTS

ELECTRICITY/ELECTRONICS II

COURSE DESCRIPTION:

Students work with simple electronic devices and circuits. Projects are built using diodes, semiconductors, integrated circuits and vacuum tubes.

COURSE GOALS:

Experiences and activities of this INDUSTRIAL ARTS course will enable the student to:

1.1 narrate basic concepts of the electron theory.

1.2 interpret general schematic diagrams.

1.3 explain the needs for a systematic and safe procedure in setting up experimental circuits and servicing equipment.

2.1 explain the theory of operation in AC and DC circuits of Ohm's Law, Kirchoff's Law and Watt's Law involving resistors, coils, capacitors and transistors.

2.2 develop proficiency in the safe use of electrical test equipment and methods of solving circuit problems.

2.3 exhibit insight into the application of technology to problems of electrical design and servicing.

3.1 evaluate the significance of manufactured products produced by the electricity/electronics industry

SUGGESTED COURSE OUTLINE:

I. The Science of Electronics

II. Sources of Electricity

III. Circuits and Power

IV. Magnetism

V. Generators and Motors

VI. Inductance and RL Circuits

VII. Capacitance in Electrical Circuits

VIII. Tuned Circuits: RCL Networks

IX. Instruments and Measurements

X. Career Opportunities

XI. The Industrial Arts Student Association

TASK # 38

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Instruments and Measurements

TASK: Develop an Awareness and Proper Safety Procedures to Follow When Working With Electricity/Electronics.

CRITERION REFERENCED MEASURE: Develop an awareness and proper safety procedures to follow when working with electricity/electronics.

PERFORMANCE GUIDES:

1. Develop a list of safety procedures to follow when working with electricity/electronics.
2. Wear the proper eye protection.
3. Report any equipment that does not work.
4. Report all accidents.
5. Check with the instructor on use of equipment.
6. Develop a receptive attitude toward safety.

TASK # 39

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Vacuum Tubes and Semiconductors

TASK: Describe the Physical Characteristics of Vacuum Tubes.

CRITERION REFERENCED MEASURE: List and describe the physical characteristics of vacuum tubes including both diode and triode types.

PERFORMANCE GUIDES:

1. Read assignment on vacuum tubes.
2. Examine different types of vacuum tubes.
3. Participate in class discussion on vacuum tubes.
4. Draw a schematic symbol showing direct and indirect heated cathodes and label the parts.
5. Develop a list of the basic physical characteristics of vacuum tubes - diode, triode, and others.
6. Perform selected experiments on vacuum tubes:
   a. voltage measurement
   b. current measurement
   c. resistance measurement
7. Participate in class discussion on general use of vacuum tubes.
8. Develop a list of consumer products that use vacuum tubes.
9. List the general uses of vacuum tubes today.

TASK # 40

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Instruments and Measurements

TASK: Develop Skill in Using the Tube Checker.

CRITERION REFERENCED MEASURE: Demonstrate skills in using the tube tester.

PERFORMANCE GUIDES:

1. Review technical manuals on the tube tester.
2. Observe teacher demonstration on the proper setup procedures for using the tube tester.
3. Demonstrate the proper procedure used in setting up the tube tester.
4. Use the tube tester to check vacuum tubes.

TASK # 41

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Vacuum Tubes and Semiconductors

TASK: Describe the Physical Characteristics of Semiconductors.

CRITERION REFERENCED MEASURE: List and describe the physical characteristics of semiconductors including both diodes and transistors.

PERFORMANCE GUIDES:

1. Read assignment on semiconductors.
2. Examine different types of semiconductors.
3. Participate in class discussion on semiconductors.
4. Draw the schematic symbols for the different semiconductors and label the parts.
5. Develop a list of semiconductor devices.
6. Perform selected experiments on semiconductor
    a. Voltage measurements
    b. Current measurements
    c. Resistance measurements
7. Describe the basic physical characteristics of semiconductors, diode and transistor.

TASK # 42

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Instruments and Measurements

TASK: Develop Skills in Using the Transistor Checker.

CRITERION REFERENCED MEASURE: Demonstrate skills in using the transistor checker.

PERFORMANCE GUIDES:

1. Review technical manual on the transistor checker.
2. Observe teacher demonstration on the proper setup procedure for using the transistor checker.
3. Demonstrate the proper procedure used in setting up the transistor checker.
4. Use the transistor checker to check transistors in and out of circuits.

TASK # 43

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Power Supply

TASK: Differentiate Between Different Types of Power Supplies.

CRITERION REFERENCED MEASURE: List the different types of power supplies and differentiate between them.

PERFORMANCE GUIDES:

1. Read assignment on power supplies.
2. Examine schematic drawings of different power supplies and draw a block diagram of them.
3. Visually inspect power supplies found in consumer products.
4. Develop a list of different types of power supplies found in consumer products and give the characteristics of each.

TASK # 44

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Power Supply

TASK: Demonstrate an Understanding of the Difference Between Half-Wave and Full-Wave Rectification.

CRITERION REFERENCED MEASURE: Explain the difference between half-wave and full-wave rectification.

PERFORMANCE GUIDES:

1. Observe teacher demonstrations on various power supplies.
2. Review schematics drawings of different power supplies.
3. Perform selected experiments on power supplies: half and full wave rectification (single diode, two diode, and bridge):
   a. Voltage and waveform measurements
   b. Current measurements
   c. Resistance measurements
4. List the different types of power supply rectifier circuits and explain the operation of each.

TASK # 45

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Power Supply

TASK: Explain the Purpose of Filter Circuits.

CRITERION REFERENCED MEASURE: Describe the purpose of filter circuits in power supplies.

PERFORMANCE GUIDES:

1. Participate in class discussion on filter circuits.
2. Explain the purpose for using capacitors, resistors, and chokes in filter circuits.
3. Observe teacher demonstration on power supply filter circuits.
4. Perform selected experiments on power supply filter circuits:
   a. Voltage and ripple measurements - oscilloscope
   b. Current measurements
   c. Resistance measurements
5. Describe the different types of filter circuits and explain their functions.

TASK # 46

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Electron Amplifiers

TASK: Explain Electron Amplication.

CRITERION REFERENCED MEASURE: Describe electron amplication in vacuum tubes and transistors.

PERFORMANCE GUIDES:

1. Read assignment on electron amplifiers.
2. Participate in class discussion on different types of amplifiers: vacuum tube and transistor.
3. Review schematics of different amplifiers including vacuum tube and transistors.
4. Review technical amplification data sheets on vacuum tubes and transistors.
5. Observe teacher demonstration on amplification.
6. Perform selected experiments on amplifiers including vacuum tubes and/or transistors:
   a. Voltage and waveform measurements - VOM and oscilloscope
   b. Current measurements
   c. Resistance measurements

TASK # 47

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Electron Amplifiers

TASK: Compare the Difference Between the Various Types of Amplifier Couplings.

CRITERION REFERENCED MEASURE: Compare the difference between the various types of amplifier couplings including transformer, RC coupling, and direct coupling.

PERFORMANCE GUIDES:

1. Review schematics of the different amplifier couplings.
2. Select an appropriate amplifier and identify the type of coupling used between stages.
3. Measure the input and output voltage and compare the waveforms at each stage.
4. Participate in class discussion on amplifier couplings, types and purpose of each.

TASK # 48

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Electron Amplifiers

TASK: Develop Skill in Testing Amplifiers.

CRITERION REFERENCED MEASURE: Demonstrate skill in testing amplifiers including vacuum tube and transistor.

PERFORMANCE GUIDES:

1. Observe teacher demonstration on procedures for testing different amplifiers.
2. Review schematics on the different types of amplifiers.
3. Select the proper equipment needed to test an experimental or consumer product amplifier:
   a. VOM or digital multimeter
   b. Oscilloscope
   c. Vacuum tube-tester
   d. Transistor tester
   e. Signal generator
4. Perform service measurements on experimental and/or consumer amplifier.

TASK # 49

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Electron Amplifiers

TASK: Develop Skills in Testing and Using Technical Data Associated with Audio Amplifiers.

CRITERION REFERENCED MEASURE: Demonstrate skills in testing and using technical data associated with audio amplifiers.

PERFORMANCE GUIDES:

1. Write for or acquire technical material on vacuum tubes and semiconductors.
2. Review technical material on vacuum tubes and semiconductors.
3. Cross reference and substitute transistors in different amplifiers.
4. Test transistors in and out of circuit using the transistor checker.
5. Test vacuum tubes on the vacuum tube checker.

TASK # 50

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Electronic Oscillators

TASK: Explain the Principle of Oscillation.

CRITERION REFERENCED MEASURE: Describe the principles of oscillation.

PERFORMANCE GUIDES:

1. Read assignment on electronic oscillators.
2. Observe teacher demonstration on oscillation principle.
3. Participate in class discussion on electronic oscillators.
4. Explain the principles and purposes of an electronic oscillator.

TASK # 51

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Electronic Oscillators

TASK: Differentiate between the Various Types of Electronic Oscillators.

CRITERION REFERENCED MEASURE: Differentiate between the various types of electronic oscillators including Armstrong, Hartley, Colpitt, and Crystal oscillators.

PERFORMANCE GUIDES:

1. Read assignment on electronic oscillators.
2. Participate in class discussion on oscillator.
3. Observe teacher demonstration on testing the various types of oscillators: Armstrong, Hartley, Colpitt and Crystal.
4. Perform selected experiments on the various electronic oscillators - waveforms using VOMs and oscilloscopes.
5. Explain the difference between the various oscillators.

TASK # 52

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Radio Transmitters

TASK: Demonstrate an Understanding of the Basic Communication Models.

CRITERION REFERENCED MEASURE: Describe the basic communication models including one-way and two-way communications.

PERFORMANCE GUIDES:

1. Read assignment on basic communications.
2. Participate in class discussion on the basic communication models, one-way and two-way.
3. Draw the one and two-way communication models, label each block, and describe the process in each block.

TASK # 53

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Radio Transmitters

TASK: Explain the Function of a Radio Transmitter.

CRITERION REFERENCED MEASURE: Describe the function of a radio transmitter (continuous wave, CW transmitters.)

PERFORMANCE GUIDES:

1. Read assignment on radio transmission.
2. Participate in class discussion on radio transmission: CW transmitters.
3. Select the appropriate equipment to observe CW transmission:
   a. Power supply - dc variable
   b. Oscilloscope
4. Perform selected experiments and observe CW transmission.

TASK # 54

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Radio Transmitters

TASK: Explain Amplitude Modulation (AM).

CRITERION REFERENCED MEASURE: Describe amplitude modulation.

PERFORMANCE GUIDES:

1. Participate in class discussion on amplitude modulation.
2. Observe teacher demonstration on constructing and testing a amplitude modulated circuit.
3. Select the appropriate equipment to test an amplitude modulated circuit:
    a. Power supply - dc variable
    b. Oscilloscope
    c. AF signal source
4. Perform appropriate experiments on an amplitude modulated circuit (observe amplitude modulation on oscilloscope.)

TASK # 55

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Radio Transmitters

TASK: Explain Frequency Modulation (FM).

CRITERION REFERENCED MEASURE: Describe frequency modulation.

PERFORMANCE GUIDES:

1. Participate in class discussion on frequency modulation.
2. Observe teacher demonstration on constructing and testing a frequency modulated circuit.
3. Select the appropriate equipment to test a frequency modulated circuit:
   a. Power supply - dc variable
   b. Oscilloscope
   c. AF signal source
4. Perform appropriate experiments on frequency modulation circuits (observe frequency modulation on the scope).

TASK # 56

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Radio Receivers

TASK: Explain the Difference between AM and FM Radio Receivers.

CRITERION REFERENCED MEASURE: Describe and illustrate the difference between AM and FM radio receivers.

PERFORMANCE GUIDES:

1. Read assignment on radio receivers.
2. Participate in class discussion on AM and FM radio receivers.
3. Define AM and FM.

TASK # 57

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Radio Receivers

TASK: Explain the Basic Function of RF Tuning Circuit.

CRITERION REFERENCED MEASURE: Describe the basic function of RF tuning circuit.

PERFORMANCE GUIDES:

1. Participate in class discussion on RF tuning circuits.
2. Observe teacher demonstration on construction and testing a RF tuning circuit.
3. Review schematic drawings of RF tuning circuits.
4. Select the appropriate equipment to test the tuning limits of a RF circuit:
    a. VOM
    b. RF signal generator
    c. Oscilloscope
5. Perform selected experiments on RF circuits (observe the tuning action).

TASK # 58

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Radio Receivers

TASK: Explain the Purpose of a Diode Detector Circuit.

CRITERION REFERENCED MEASURE: Describe and the use of a diode detector circuit.

PERFORMANCE GUIDES:

1. Participate in class discussion on diode detector circuits.
2. Observe teacher demonstration on constructing and testing a diode detector circuit.
3. Review schematics of diode detector circuits.
4. Select the appropriate equipment to test a diode detector circuit:
   a. RF signal generator with AM output
   b. Oscilloscope
5. Perform selected experiments on diode detector circuits (trace the signal path).

TASK # 59

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Television

TASK: Develop Skills Adjusting the Monochrome Television Receiver Control.

CRITERION REFERENCED MEASURE: Demonstrate skills in adjusting the monochrome television receiver controls.

PERFORMANCE GUIDES:

1. Read assignment on monochrome television receivers.
2. Participate in class discussion on monochrome television receiver control adjustments.
3. Review block diagrams of monochrome television to the actual layout of the T.V.
4. Observe demonstration on monochrome television receiver control adjustments.
5. Perform adjustments on monochrome television receiver controls and observe its affect on the operation.

TASK # 60

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Integrated Circuits

TASK: Explain the Difference between Digital and Linear Integrated Circuits.

CRITERION REFERENCED MEASURE: Describe the difference between digital and linear integrated circuits.

PERFORMANCE GUIDES:

1. Read text material on digital and linear integrated circuits.
2. Discuss integrated circuits in class.
3. List the advantages and uses of each type of integrated circuit.

TASK # 61

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Integrated Circuits - Digital

TASK: Describe Logic Gates.

CRITERION REFERENCED MEASURE: Differentiate between logic, and, or, not, nand, and nor gates and the function of each.

PERFORMANCE GUIDES:

1. Discuss in class each type of gate and their use.
2. View a block diagram of each type of gate.
3. List each gate and its primary function.
4. Describe briefly each type of gate.
5. Observe teacher demonstration constructing and testing integrated digital circuits.
6. Select appropriate equipment to test the digital (integrated) circuits.
7. Perform selected experiments on digital and integrated circuits.

TASK # 62

AREA OF COMPETENCE; Electricity/Electronics II

CONTENT/CONCEPT: Career Opportunities

TASK: Draw a Career Path for a Selected Career in the Electronics Field.

CRITERION REFERENCED MEASURE: Discuss in depth a selected career in the electronics field.

PERFORMANCE GUIDES:

1. Discuss in class various career opportunities in electronics.
2. Select a career and complete an assignment on the requirements needed to enter that area.
3. Observe and talk with a person in the field of your choice and/or view an audio visual presentation on the select career field.

TASK # 63

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Career Opportunities

TASK: Develop a List of Educational Courses that would help Prepare an Individual for a Career in Electronics.

CRITERION REFERENCED MEASURE: List the basic educational courses necessary to enter a selected career in electronics.

PERFORMANCE GUIDES:

1. Discuss the requirements with guidance or personnel persons who are familiar with electronics.
2. Contact various colleges and/or trade schools for their program in electronics.
3. Talk with persons in the selected field.
4. Research state, national and industrial publications on the chosen area.

TASK # 64

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: Electricity and Society

TASK: Explain the Effects that Electricity/Electronics has had on the Development of Industry and Society.

CRITERION REFERENCED MEASURE: Describe the effects that the development of electronics has had on humanity, society, and industry.

PERFORMANCE GUIDES:

1. Read assignments on the development of electronics.
2. Discuss how developments in electricity and electronics have altered our way of life.

TASK # A.I.A.S.A.

AREA OF COMPETENCE: Electricity/Electronics II

CONTENT/CONCEPT: In Class Industrial Arts Student Association

TASK: Participation (involvement) in a democratic organization with activities using course content.

CRITERION REFERENCED MEASURE: Participate with other students in organized activities using industrial resources, leadership or followership, service or enterprise projects and recognition for workmanship.

PERFORMANCE GUIDES:

1. Organize class into personnel system for democratic decision making and leader/follower development.
2. Invite speakers to class and use resources of industry and technology from the community.
3. Carry out worthy group activities and projects to improve or serve school or community.
4. Operate an enterprise system to produce item of economic value.
5. Encourage competition in areas of course to motivate and recognize achievement.

NOTE: These performance guides are expanded in the publication titled Student Association Activities in Industrial Arts Instruction available from the Industrial Arts Service, Virginia Department of Education, Richmond, Virginia 23216.

A CATALOG OF TASKS
FOR
COMPETENCY-BASED INSTRUCTION
IN

Energy and Power
I & II

VIRGINIA
INDUSTRIAL ARTS

Industrial Arts Education Service
Department of Education
Commonwealth of Virginia
Richmond, Virginia 23216
1979

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Was Prepared At
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INTRODUCTION

In the summer of 1977, The Industrial Arts Curriculum K-12 was introduced. This plan outlined the preferred courses, course sequences, and purposes which should be addressed in Virginia industrial arts programs. However, the model curriculum plan did not establish exact knowledge, skills, and attitudes which all learners should possess as they exit particular programs.

The purpose of the following competency catalog of tasks is to establish a basis for program content selection and criterion levels from which one may measure to see if individual learners have achieved a minimal level of competence through study in a particular course. In this manner a means to improve education and its accountability to citizenry can be designed based upon the identification and attainment of prespecified outcomes for the industrial arts content area. Although this catalog is designed and presented in a sequencial order of task statements, it does not mean that it must be structured into local programs in this order. Individual instructors may choose to restructure the sequence of competency tasks to meet local needs.

In preparing this catalog considerable research and validation was undertaken to specify those minimal tasks which every learner enrolling in the course should be able to perform. The format of this and other catalogs includes the following areas: area of competence, content/concept, task, criterion referenced measure, and performance guides. The area of competence identifies the industrial arts course for which the particular task was prepared. Content/concept identifies the sub-area with which the particular task is associated. The task is the knowledge, skills or attitudes which the learner should possess after instruction in the industrial arts class. Criterion references measures are means to identify if the learner can successfully perform the stated task and finally, performance guides are sub-tasks which lead to the development of the knowledge, skills and attitudes

identified in the tasks. These areas are illustrated in Table 1. It should be noted that performance objectives have been omitted from the catalogs of tasks. This was done to allow individual instructors to develop objectives they see necessary to meet the local learning environment.

In Table 2 is identified the location of this course in the total program of industrial arts for Virginia. Other competency catalogs are contained in this publication and the remaining catalogs may be obtained from the Industrial Arts Education Service, Division of Vocational Education, Department of Education, P.O. Box 6Q, Richmond, Virginia 23216.

FORMAT DESCRIPTION

AREA OF COMPETENCE: Identifies the industrial arts course for which the particular task was prepared.

CONTENT/CONCEPT: Identifies the sub-area which the particular task is associated.

TASK: Identifies the knowledge, skills, or attitudes which the learner should possess after completing instruction in the industrial arts class.

CRITERION REFERENCED MEASURE: The means to identify if the learner can successfully perform the stated task.

PERFORMANCE GUIDES: Identifies sub-tasks which lead to the development of the knowledge, skills, and attitudes identified in the tasks.

TABLE 1

The Industrial Arts Curriculum

Level	Goal	Program
Elementary School	Learning Reinforcement	Industrial Arts activities integrated within the elementary curriculum
Middle or Junior High School	Orientation and Exploration	Exploring Technology Modern Industry Construction Manufacturing
High School	Technical	Communication Technology Materials and Processes Technology Power and Transportation Technology Architectural Drawing Basic Technical Drawing Electricity and Electronics Energy and Power Engineering Drawing Graphic Communications Metals Technology Woods Technology
	Personal Enrichment	General Industrial Arts Industrial Crafts

TABLE 2

ENERGY AND POWER I

COURSE DESCRIPTION:

Students learn about the application of power and energy systems to common power devices and transportation vehicles. Students apply theory to the practical servicing of common machines. Application is made to small gasoline engines, outboard motors, motorcycles, lawn mowers, etc.

COURSE GOALS:

Experiences and activities of this INDUSTRIAL ARTS course will enable the student to:

1.1 determine some of the economic and social effects that thermal, mechanical and fluid power have on society.

1.2 determine the working conditions in a service enterprise.

1.3 describe the automotive electrical and fuel systems.

1.4 demonstrate the principles of internal and external combustion engines.

2.1 exhibit safe practices in working with power systems, tools and equipment.

2.2 demonstrate the ability to perform a tune-up with expertise.

3.1 exhibit efficiency in use of time

3.2 show a willingness to use good work habits such as; orderliness, cleanliness and care of property.

SUGGESTED TOPICAL OUTLINE:

I. Introduction to Power and Energy Technology

II. Electrical Power
    a. The nature of electricity
    b. The nature of magnetism
    c. Electrical applications

III. Heat Engines
    a. Introduction
    b. External combustion engines
    c. Internal combustion engines
    d. Rocket engines

IV. The Industrial Arts Student Association

TASK # 1

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Introduction to Power and Energy Technology

TASK: Define Energy.

CRITERION REFERENCED MEASURE: Define energy as having the capability to do work.

PERFORMANCE GUIDES:

1. View filmstrip on energy.
2. Observe teacher presentation on energy.
3. Bring into class "news clipping" about energy and discuss them.

TASK # 2

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Introduction to Power and Energy Technology

TASK: Define the Terms Kinetic and Potential Energy.

CRITERION REFERENCED MEASURE: Define kinetic energy as energy in motion and potential energy as stored energy.

PERFORMANCE GUIDES:

1. Observe teacher demonstrations on potential and kinetic energy.
2. Read assignment on potential and kinetic energy.
3. Perform experiment on potential energy.
4. Perform experiment on kinetic energy.
5. Give two examples of potential and kinetic energy.

TASK # 3

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Introduction to Power and Energy Technology

TASK: Define the Term Power.

CRITERION REFERENCED MEASURE: Define the term power as energy or work per unit time.

PERFORMANCE GUIDES:

1. Observe teacher presentation on power.
2. Participate in class discussions on power.
3. Read assignments on power.

TASK # 4

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Introduction to Power and Energy Technology

TASK: Identify Five Eras in the History of Power and Energy Utilization by Civilizations.

CRITERION REFERENCED MEASURE: List and describe five eras in the history of power and energy utilization by civilizations.

PERFORMANCE GUIDES:

1. Observe teacher presentation on history of power and energy.
2. Observe demonstration on model construction of power and energy developments.
3. Read assignments on history of power and energy.
4. Construct a model from one era in history of power and energy.
5. List and describe the five eras in the history of power and energy.

TASK # 5

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Introduction to Power and Energy Technology

TASK: Compare and Contrast Technological Advancement with Energy Consumption.

CRITERION REFERENCED MEASURE: List and describe several comparisons between the amount of energy consumed and its effect on technological advancements.

PERFORMANCE GUIDES:

1. Observe teacher presentation on technological advancement.
2. View film: Energy and Technology.
3. Read "current events" assignments on energy consumption.
4. Identify familiar energy consuming technological devices and discuss their effects on society.

TASK # 6

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Introduction to Power and Energy Technology

TASK: List and Describe Career Opportunities in Power and Energy.

CRITERION REFERENCED MEASURE: Identify and discuss career opportunities in power and energy technology.

PERFORMANCE GUIDES:

1. Observe teacher presentation on power mechanics related careers.
2. Participate in class discussion on careers.
3. List several opportunities for careers in power and energy including:
   a. Entry level training requirements
   b. Salary levels and benefits
   c. Working conditions
   d. Advancement opportunities
   e. Application for employment
4. Select and prepare a report on employment or a career in power and energy technology.

TASK # 7

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Introduction to Power and Energy Technology

TASK: Develop Proper Attitudes Toward the Respect, Use, and Care for Tools and Equipment.

CRITERION REFERENCED MEASURE: Demonstrate the safe and proper care, use, and maintenance of tools and equipment in Power and Energy Technology.

PERFORMANCE GUIDES:

1. Participate in class discussion on safe tool usage.
2. Participate in class demonstrations on the care and maintenance of tools and equipment.
3. Demonstrate the proper use, care, and maintenance of equipment and tools used in power technology activities.
4. Demonstrate consistent "learned" safety habits.

TASK # 8

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Introduction to Power and Energy Technology

TASK: List and Discuss Safety Practices Used in Power Mechanics.

CRITERION REFERENCED MEASURE: List and describe the safety practices which are used in power mechanics.

PERFORMANCE GUIDES:

1. Participate in class discussion on safety practices.
2. List safety practices to be employed in the power mechanics area.
3. Perform and participate in class activities safely.
4. View safety films for power mechanics.
5. Elect a class safety director.

TASK # 9

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Electrical Power

TASK: Define Electricity.

CRITERION REFERENCED MEASURE: Define electricity as the flow of electrons along a conductor.

PERFORMANCE GUIDES:

1. Read assignment on the nature of electricity.
2. Participate in class discussions on electricity.
3. Perform basic experiments in electricity.
4. List various forms of electricity.

TASK # 10

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Electrical Power

TASK: Identify and Describe the Components of a Complete Circuit.

CRITERION REFERENCED MEASURE: List and discuss the components of a complete circuit as a source, conductor, and load.

PERFORMANCE GUIDES:

1. Read assignments on complete circuits.
2. Participate in class discussion on electrical circuits.
3. Perform experiments with different conductor materials.
4. List and describe components of an electrical circuit.

TASK # 11

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Electrical Power

TASK: List and Describe Electrical Measuring Terms.

CRITERION REFERENCED MEASURE: Demonstrate a knowledge of the measuring terms used in electricity with emphasis on ohms, volts, amperes.

PERFORMANCE GUIDES:

1. Read assignments on electrical measuring terms.
2. Observe teacher presentation on electrical measuring terms.
3. List and describe the electrical terms:
    a. Ohm
    b. Volt
    c. Ampere

TASK # 12

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Electrical Power

TASK: Define Ohm's Law

CRITERION REFERENCED MEASURE: Define Ohm's Law as: in any circuit where the only opposition to the flow of electrons is resistance, there is a relationship between the values of voltage, current, and resistance.

PERFORMANCE GUIDES:

1. Read assignments on Ohm's Law.
2. Participate in teacher presentation and class discussion on Ohm's Law.
3. Demonstrate a knowledge of the formula $E = I \times R$.
4. Solve various problems using the Ohm's Law formula.
5. Discuss the significance of Ohm's Law as related to electrical power.

TASK # 13

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Electrical Power

TASK: Define and Describe Direct and Alternating Current.

CRITERION REFERENCED MEASURE: Define direct current as a constant amplitude voltage and alternating current as a time varying or changing amplitude voltage.

PERFORMANCE GUIDES:

1. Read assignments on direct and alternating current.
2. Observe teacher presentations on direct and alternating current.
3. Perform experiments using direct and alternating current.

TASK # 14

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Electrical Power

TASK: Develop Skill in Identifying, Connecting, and Using Series, Parallel, and Series-Parallel Circuits.

CRITERION REFERENCED MEASURE: Given appropriate tools and materials, connect series, parallel, and series-parallel circuits.

PERFORMANCE GUIDES:

1. Read assignments on series, parallel, and series-parallel circuits.
2. Participate in demonstrations and discussions on connecting series, parallel, and series-parallel circuits.
3. Connect and experiment with series, parallel, and series-parallel circuits.

TASK # 15

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Electrical Power

TASK: Describe the Nature of Magnetism.

CRITERION REFERENCED MEASURE: Explain the nature of magnetism as the property of certain substances that attract or repel certain other substances according to fixed physical laws.

PERFORMANCE GUIDES:

1. Read assignments on magnetism.
2. Discuss the use of magnetism as related to power mechanics.
3. Observe teacher demonstrations on magnetism.
4. Perform experiment on magnetism.

TASK # 16

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Electrical Power

TASK: Explain how Magnetism may be Used to Generate an Electromotive force.

CRITERION REFERENCED MEASURE: Explain how an electromotive force is generated by electromagnetic induction.

PERFORMANCE GUIDES:

1. Read assignment on electromagnetic induction.
2. Observe teacher demonstration on electromagnetic induction.
3. Perform generator experiment.
4. Discuss the applications of electromagnetic induction in producing an electromotive force.

TASK # 17

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Electrical Power

TASK: Explain how Electric Motors have Reduced the Burden of Work for People.

CRITERION REFERENCED MEASURE: List and discuss ways in which electric motors have reduced the burden of work for people.

PERFORMANCE GUIDES:

1. Read assignments on electric motors.
2. Participate in class discussion on electric motors.
3. List ways in which electric motors have reduced the burden of work for people.

TASK # 18

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Introduction to Heat Engines

TASK: Define the Term Heat Engine.

CRITERION REFERENCED MEASURE: Define the term heat engine as a source of mechanical energy or prime mover.

PERFORMANCE GUIDES:

1. Read assignments on heat engines.
2. View GM films on engines.
3. Participate in class discussion on heat engines.
4. Observe teacher presentation and demonstration on heat engines.

TASK # 19

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Introduction to Heat Engines

TASK: Demonstrate a Knowledge of the Health and Environmental Considerations Related to Heat Engines.

CRITERION REFERENCED MEASURE: Identify and describe the health and environmental problems and considerations related to internal combustion engines.

PERFORMANCE GUIDES:

1. Read assignments on environmental problems related to heat engines.
2. Identify exhaust emissions from heat engines.
3. Describe the effects that pollution has upon the environment with emphasis on:
   a. Air
   b. Water
   c. Land

TASK # 20

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Introduction to Heat Engines

TASK: Define Steam.

CRITERION REFERENCED MEASURE: Define and describe the term steam as the visible vapor which rises from boiling water with emphasis on the concept of the expansion of a gas.

PERFORMANCE GUIDES:

1. Read assignment on steam.
2. Observe teacher presentation on steam as a primemmover.
3. Observe demonstration of a model steam engine in use.
4. Complete activity assignment on the steam engine system.
5. Construct a simple steam engine using Hero's design.

TASK # 21

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Introduction to Heat Engines

TASK: Describe the Operation of a Steam Turbine and Generator.

CRITERION REFERENCED MEASURE: List and explain the steps involved in the operation of a steam turbine and generator.

PERFORMANCE GUIDES:

1. Read assignments on the operation of a steam turbine.
2. Participate in class discussions on steam turbines.
3. List steps in steam turbine operation.
4. Explain how a steam turbine may be used to convert heat energy into rotary motion.
5. Discuss the applications of steam turbines.
6. List and describe the basic components of combustion in steam generators.
7. Participate in a field trip to a boiler room or power plant that utilizes steam generators.

TASK # 22

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Generating Power with Steam

TASK: List and Define Three Methods of Heat Transfer.

CRITERION REFERENCED MEASURE: Identify and explain the following methods of heat transfer: radiation, conduction, and convection.

PERFORMANCE GUIDES:

1. Read assignments on heat transfer.
2. Participate in class discussions on heat transfer.
3. List three methods of heat transfer.
4. Perform experiments with heat transfer.

TASK # 23

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Generating Power with Steam

TASK: Identify Three Primitive Boilers and Describe their Significance.

CRITERION REFERENCED MEASURE: Identify and Describe the significance of the following primitive boilers: the shell boilers, fire-tube boiler, and the water-tube boiler.

PERFORMANCE GUIDES:

1. Read assignment on primitive boilers.
2. Participate in class discussion on boilers.
3. List and describe three primitive boilers.

TASK # 24

AREA OF COMPETENCE: Energy and Power I

7

CONTENT/CONCEPT: Generating Power with Steam

TASK: Describe how Boiler Design has led to Improved Fuel Efficiency and Increased Power Output.

CRITERION REFERENCED MEASURE: Explain how boiler design has led to increasing fuel economy and efficiency and how it has increased power output.

PERFORMANCE GUIDES:

1. Read assignments on boiler design.
2. Observe teacher presentation on boiler design.
3. Participate in class discussion on boiler design.
4. Class discussion on steam locomotive engine design.

TASK # 25

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Generating Power with Steam

TASK: Identify Four Different Fuels that may be used as a Source of Heat for Boilers.

CRITERION REFERENCED MEASURE: List and describe the following fuels which may be used as a source of heat for boilers: coal, oil, natural gas, and nuclear.

PERFORMANCE GUIDES:

1. Read assignments on fuels used as a source of heat for boilers.
2. Participate in class discussion on boiler fuels.
3. List four different fuels that can be used as a source of heat for boilers.

TASK # 26

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Generating Power with Steam

TASK: Discuss how Nuclear Energy may be used to Generate Steam.

CRITERION REFERENCED MEASURE: Describe the ways in which nuclear energy may be used to generate steam.

PERFORMANCE GUIDES:

1. Read assignments on generating steam from nuclear energy.
2. View film on nuclear energy.
3. Discuss and describe the advantages and disadvantages of nuclear energy as a fuel.

TASK # 27

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engines

TASK: Describe the Term Internal Combustion Engine.

CRITERION REFERENCED MEASURE: Define and describe the concept of an internal combustion engine.

PERFORMANCE GUIDES:

1. Read assignments on internal combustion engines.
2. Participate in class discussion on internal combustion engines.
3. Participate in demonstration of internal combustion engines.
4. Introduction of engine disassembly and inspection unit.

TASK # 28

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engines

TASK: Compare and Contrast the Internal Combustion Engine to the External Combustion Engine.

CRITERION REFERENCED MEASURE: List and outline the likenesses and differences between internal and external combustion engines.

PERFORMANCE GUIDES:

1. Read assignments on internal and external combustion engines.
2. Participate in class discussion on internal and external combustion engines.
3. List likenesses and differences between internal combustion engines and external combustion engines.
4. Give examples of both internal combustion and external combustion engines.

TASK # 29

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engines

TASK: Identify and Describe the Four Strokes of the Otto Cycle.

CRITERION REFERENCED MEASURE: List and discuss the following strokes of the Otto cycle: intake, compression, power, and exhaust.

PERFORMANCE GUIDES:

1. Observe teacher presentation of the Otto cycle.
2. View film on the four stroke engine (GM).
3. List the four strokes of the Otto cycle.
4. Identify relative components in small engine.

TASK # 30

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engines

TASK: Discuss the Two Strokes of the Two-Cycle Engine.

CRITERION REFERENCED MEASURE: Identify and describe the following two strokes of the two-cycle engine: intake/compression and power/exhaust.

PERFORMANCE GUIDES:

1. Read assignments on two-stroke engines.
2. Observe teacher demonstration on two-stroke engine.
3. Student experiences with two-stroke engine.
4. List advantages of the two-stroke engine.

TASK # 31

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Electrical Ignition.

TASK: Demonstrate a Knowledge of the Electrical System of the Internal Combustion Engine.

CRITERION REFERENCED MEASURE: Describe the purpose and function of the electrical system in an internal combustion engine.

PERFORMANCE GUIDES:

1. Read assignments on internal combustion engine electrical systems.
2. Participate in class discussion on electrical systems.
3. Identify components of an internal combustion engine electrical system on a teaching aid or experimental equipment.

TASK # 32

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Electrical Ignition.

TASK: Identify and Describe the Operation of the Lead-Acid Storage Battery.

CRITERION REFERENCED MEASURE: Given a diagram of a lead-acid storage battery, identify and describe its operation and purpose.

PERFORMANCE GUIDES:

1. Read assignments on lead-acid storage batteries.
2. Observe teacher demonstration on lead-acid batteries.
3. Perform basic battery maintenance.
4. Top-off water level of a lead-acid battery.
5. Clean terminals of a battery.
6. Perform hydrometer tests.
7. Recharge a battery.

TASK # 33

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engines - Starting Engines

TASK: Discuss the Operation of Starting Systems on a Gasoline Engines.

CRITERION REFERENCED MEASURE: Identify the starting systems used on gasoline engines with emphasis on electrical and rope rewind types and describe their purpose and function.

PERFORMANCE GUIDES:

1. Read assignments on electrical starting systems.
2. Observe teacher presentations on electrical starting systems.
3. Identify and describe electrical and rope rewind starting systems.

TASK # 34

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Electrical Ignition

TASK: Describe the Concept of Magneto Ignition.

CRITERION REFERENCED MEASURE: Describe the purpose and function of the magneto ignition and develop skill in its adjustment.

PERFORMANCE GUIDES:

1. Read assignments on magneto ignition.
2. Observe teacher demonstration on magneto ignition.
3. Disassemble and identify electrical components of a magneto ignition unit.
4. Test components of magneto ignition unit.
5. Assemble a magneto ignition unit.
6. Adjust magneto ignition unit and check for operation with emphasis on:
    a. Armature gap
    b. Point gap
    c. Spark plug gap

TASK # 35

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Electrical Ignition

TASK: Develop Skill in Making Dwell and Timing Adjustments.

CRITERION REFERENCED MEASURE: Demonstrate skill in setting and adjusting dwell and timing in the ignition system of an internal combustion engine.

PERFORMANCE GUIDES:

1. Read assignments on dwell and timing adjustments.
2. Observe a teacher demonstration on dwell and timing adjustments.
3. Perform basic ignition tests.
4. Set and adjust dwell and timing on an internal combustion engine.

TASK # 36

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Fuel System

TASK: Discuss the Function of the Fuel System on the Gasoline Engine.

CRITERION REFERENCED MEASURE: Describe the purpose and function of the fuel system on the gasoline engine.

PERFORMANCE GUIDES:

1. Read assignments on gasoline engine fuel systems.
2. Observe teacher demonstration on fuel systems.
3. List and describe fuel system components.
4. Discuss octane ratings and uses of gasoline fuels.

TASK # 37

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Fuel Systems

TASK: Discuss the Principle of Carburetor Operation.

CRITERION REFERENCED MEASURE: Describe and explain the principle of how a carburetor functions in an internal combustion engine with emphasis on the venture principle.

PERFORMANCE GUIDES:

1. Read assignments on carburetors.
2. Observe teacher demonstration on carburetor operation.
3. Discuss the venturi principle.
4. Disassembly, inspection, and assembly of a simple carburetor.
5. Successfully set-up and adjust a carburetor.

TASK # 38

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Fuel Systems

TASK: Discuss and Develop Skill in the Care and Maintenance of Fuel Filter Systems.

CRITERION REFERENCED MEASURE: Demonstrate a knowledge of the purpose of fuel filters and develop skill in the care and maintenance of fuel filter systems.

PERFORMANCE GUIDES:

1. Read assignments on fuel filters.
2. Participate in class discussions on fuel filters.
3. Participate in class demonstration on the cleaning or replacement of a fuel filter.
4. Clean and/or replace a fuel filter.

TASK # 39

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Mechanical

TASK: Discuss the Function of the Piston Assembly of a Small Engine Power Unit.

CRITERION REFERENCED MEASURE: Identify and describe the component parts and explain the function of the piston assembly of a small engine power unit with emphasis on the conversion of reciprocating motion to rotary motion.

PERFORMANCE GUIDES:

1. Read assignment on small engine piston assembly.
2. Participate in class discussion on piston assemblies.
3. Identify the piston, rings, wrist pin, connecting rod, and bearings of a piston assembly.
4. Perform measurements on piston assemblies.
5. Fit and install piston rings.

TASK # 40

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Mechanical

TASK: Compare and Contrast the Rotation of the Crankshaft to the Camshaft on the Four-Stroke Otto Cycle Engine.

CRITERION REFERENCED MEASURE: Describe the rotation of crankshaft and camshaft operation and compare the functions of both in the four-stroke Otto cycle engine.

PERFORMANCE GUIDES:

1. Read assignments on crankshaft and camshaft in the Otto cycle engine.
2. Observe the mechanical motions on a "sectiona engine".
3. Record observations on lab experiment sheet on crankshaft and camshaft rotation.
4. Align the timing marks of the cam gear with the crankshaft on the four-stroke engine.

TASK # 41

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Mechanical

TASK: Develop Skills in Performing Precision Engine Measurements with Standard and Metric Measuring Tools.

CRITERION REFERENCED MEASURE: Given Standard and Metric measuring tools, develop skills in precision engine measurements.

PERFORMANCE GUIDES:

1. Read assignments on Standard and Metric measuring tools.
2. Teacher demonstration on the use of precision measuring tools.
3. Student performs measurement operations using standard and metric measuring tools.
4. Properly adjust the valve clearance of the intake and exhaust valves on the four-stroke gasoline engine.
5. Properly adjust for crankshaft end-play.

TASK # 42

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Mechanical.

TASK: Describe the Purpose of Bearings in Mechanical Systems.

CRITERION REFERENCED MEASURE: Explain the purpose and function of bearings in engines.

PERFORMANCE GUIDES:

1. Read assignments on bearings.
2. Observe teacher presentation on bearings.
3. View film (GM) on bearing lubrication.
4. List and describe babbit, precision insert, and anti-friction bearings.

TASK # 43

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Mechanical

TASK: Contrast the Connecting Oil Clearance Measurement with Plastigage Material in Standard and Metric Units of Measure.

CRITERION REFERENCED MEASURE: Given plastigage material describe its function in connecting oil clearance measurement using both Standard and Metric units of measure.

PERFORMANCE GUIDES:

1. Demonstration of plastigage material and oil clearance measurement.
2. Perform "plastigage" measurements.
3. Determine condition of bearings.
4. Assemble components.

TASK # 44

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Lubrication

TASK: Describe the Functions of the Lubricating System in Internal Combustion Engines.

CRITERION REFERENCED MEASURE: Identify the component parts and explain their functions in the lubricating systems in internal combustion engines.

PERFORMANCE GUIDES:

1. Read assignments on lubricating systems.
2. Observe teacher demonstration on lubricating systems.
3. Identify pressurized and splash type lubricating systems.
4. List the function of engine lubricating oil.
5. Discuss non-detergent and high-detergent motor oils and their grade and weights using API and SAE specifications.
6. Perform viscosity experiments with various oil grades.

TASK # 45

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Lubrication

TASK: Compare and Contrast the Lubricating Systems Commonly Employed on Two and Four-Stroke Gasoline Engines.

CRITERION REFERENCED MEASURE: Identify and describe the lubricating systems of the two-stroke gasoline engine and the four-stroke engine, and compare their functions.

PERFORMANCE GUIDES:

1. Read assignments on lubricating systems used in two and four-stroke gasoline engines.
2. Observe and record data on lab models comparing two and four stroke lubricating systems.

TASK # 46

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Lubrication

TASK: Develop Skills in an Oil-Change Operation on a Four-Stroke Gasoline Engine.

CRITERION REFERENCED MEASURE: Given the proper tools and equipment describe and successfully perform an oil-change operation on a four-stroke gasoline engine.

PERFORMANCE GUIDES:

1. Read assignments on oil-change operation.
2. Participate in class discussion on oil changing.
3. Observe teacher demonstration on an oil change.
4. Successfully perform an oil-change operation.

TASK # 47

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Cooling

TASK: Describe the Function of the Cooling System on the Internal Combustion Engine.

CRITERION REFERENCED MEASURE: Identify the component parts and describe the purpose and function of the cooling system on the internal combustion engine.

PERFORMANCE GUIDES:

1. Read assignments on internal combustion engine cooling systems.
2. Observe teacher demonstration on cooling systems.
3. Perform cooling system maintenance of an air cooled and water cooled engine.

TASK # 48

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Cooling

TASK: Describe the Advantages of Antifreeze Coolants over Water.

CRITERION REFERENCED MEASURE: Compare and contrast the use of water with the use of engine antifreeze coolants in an internal combustion engine.

PERFORMANCE GUIDES:

1. Read assignments on engine coolants.
2. Observe teacher demonstration on the boiling point of engine coolants.
3. Observe teacher demonstration on the freezing point of engine coolants.
4. Demonstrate the purpose and use of a hydrometer.

TASK # 49

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Internal Combustion Engine Systems - Compression Ignition

TASK: Explain why Diesel Compression Ignition Engines Operate more Efficiently than Gasoline Engines.

CRITERION REFERENCED MEASURE: Compare and contrast the operation of diesel compression ignition engines with gasoline engines and explain why diesel compression ignition engines operate more efficiently.

PERFORMANCE GUIDES:

1. Read assignment on compression ignition engines and gasoline engines.
2. Participate in class discussion on diesel compression.
3. List several applications where compression ignition would be employed on internal combustion engines.

TASK # 50

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Rocket Engines

TASK: Discuss the Concept of the Reaction Engine.

CRITERION REFERENCED MEASURE: Describe and explain the concept and the function of the reaction type engine.

PERFORMANCE GUIDES:

1. Read assignments on reaction engines.
2. Participate in class discussions on reaction engines.
3. Complete work assignments on reaction engines.

TASK # 51

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Rocket Engines

TASK: Identify and Describe the Liquid Fuel Rocket.

CRITERION REFERENCED MEASURE: Identify and give a description of the purpose and function of the liquid fuel rocket.

PERFORMANCE GUIDES:

1. Observe a teacher presentation on rocket designs.
2. Observe a demonstration on model rocket construction.
3. Student plans and constructs a model rocket.

TASK # 52

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: Rocket Engines

TASK: Identify and Describe the Solid-Fueled Rocket Engine.

CRITERION REFERENCED MEASURE: Identify and give a description of the purpose and operation of the solid-fueled rocket.

PERFORMANCE GUIDES:

1. Observe teacher presentations on solid-fueled rockets.
2. Read assignments on solid-fueled rockets.
3. Student model rocket firing activity.

TASK # A.I.A.S.A.

AREA OF COMPETENCE: Energy and Power I

CONTENT/CONCEPT: In Class Industrial Arts Student Association

TASK: Participation (involvement) in a democratic organization with activities using course content.

CRITERION REFERENCED MEASURE: Participate with other students in organized activities using industrial resources, leadership or followership, service or enterprise projects and recognition for workmanship.

PERFORMANCE GUIDES:

1. Organize class into personnel system for democratic decision making and leader/follower development.
2. Invite speakers to class and use resources of industry and technology from the community.
3. Carry out worthy group activities and projects to improve or serve school or community.
4. Operate an enterprise system to produce item of economic value.
5. Encourage competition in areas of course to motivate and recognize achievement.

NOTE: These performance guides are expanded in the publication titled Student Association Activities in Industrial Arts Instruction available from the Industrial Arts Service, Virginia Department of Education, Richmond, Virginia 23216.

ENERGY AND POWER II

COURSE DESCRIPTION:

Students design, build or modify power products or small recreational vehicles to further their knowledge and skills in power, energy and transportation. Students study the application of technical systems which serve power and energy needs.

COURSE GOALS:

Experiences and activities of this INDUSTRIAL ARTS course will enable the student to:

1.1 evaluate the methods and processes used by industry to produce transportation vehicles.

1.2 discuss the development of thermal, mechanical and fluid power.

1.3 critically discuss the internal combustion engine principles.

1.4 critically discuss the application of mechanical systems to transportation vehicles.

2.1 exhibit safe practices in the handling of various tools and equipment used in power mechanics.

2.2 demonstrate the principles of the power train of an automobile.

2.3 design, plan and/or modify a small power product or recreational vehicle.

2.4 operate equipment, handle materials and utilize testing procedures in a safe and orderly manner.

3.1 exhibit good work habits, respect for and cooperation with associates.

SUGGESTED TOPICAL OUTLINE:

I. Review of the Principles of Power and Energy Technology

II. Energy Sources

III. Power Transmission Systems

IV. Fluid Power

V. Career Opportunities

VI. The Service Enterprise

VII. The Industrial Arts Student Association

TASK # 53

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Introduction to Power and Energy Technology

TASK: Discuss Safety Practices Employed in Power Mechanics.

CRITERION REFERENCED MEASURE: List and describe the safety practices to be followed in working in a power mechanics laboratory.

PERFORMANCE GUIDES:

1. Participate in class discussions on safety and first aid.
2. View safety films.
3. Elect a class safety director.

TASK # 54

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Introduction to Power and Energy Technology

TASK: Display Proper Attitudes in the Safe Use and Care for Tools and Equipment.

CRITERION REFERENCED MEASURE: Demonstrate the safe and proper care, use, and maintenance of tools and equipment in a power mechanics facility.

PERFORMANCE GUIDES:

1. Participate in class discussions on the safe use of tools.
2. Observe demonstrations on the care of tools and equipment.
3. Demonstrate consistent "learned" safety habits.

TASK # 55

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Introduction to Energy Sources

TASK: Define Mechanical Energy.

CRITERION REFERENCED MEASURE: Define the term mechanical energy as the energy of motion.

PERFORMANCE GUIDES:

1. Observe demonstration with mechanical energy.
2. Participate in class discussions on mechanical energy.
3. Give examples of mechanical energy in use.
4. Perform experiment using mechanical energy.

TASK # 56

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Introduction to Energy Sources

TASK: Define Electrical Energy.

CRITERION REFERENCED MEASURE: Define the term electrical energy as the motion of small invisible particles called electrons.

PERFORMANCE GUIDES:

1. Observe teacher presentation on electrical energy.
2. Participate in class discussion on electrical energy.
3. List examples of electrical energy in use.
4. Perform experiment involving electricity in a simple circuit.

TASK # 57

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Introduction to Energy Sources

TASK: Define Light Energy.

CRITERION REFERENCED MEASURE: Define light energy as a part of the visible spectrum of electromagnetic radiation.

PERFORMANCE GUIDES:

1. Observe teacher presentation on light energy.
2. Observe teacher demonstration on light energy uses.
3. Perform experiment involving light.

TASK # 58

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Introduction to Energy Sources

TASK: Define Chemical Energy.

CRITERION REFERENCED MEASURE: Define the term chemical energy and describe its application to power mechanics.

PERFORMANCE GUIDES:

1. Read assignments on chemical energy.
2. Participate in class discussion on chemical energy.
3. List examples of chemical energy.
4. Perform experiments with the chemical generation of an electromotive force.

TASK # 59

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Introduction to Energy Sources

TASK: Define Nuclear Energy.

CRITERION REFERENCED MEASURE: Define the term nuclear energy as energy developed by changing matter into energy with emphasis on fusion and fission.

PERFORMANCE GUIDES:

1. Read assignments on nuclear energy.
2. Participate in class discussion on nuclear energy.
3. Describe matter and its relationship to nuclear energy.
4. List examples of the uses of nuclear energy.

TASK # 60

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Introduction to Energy Sources

TASK: Define Heat Energy.

CRITERION REFERENCED MEASURE: Define the term heat energy and describe its application to power mechanics.

PERFORMANCE GUIDES:

1. Observe teacher demonstration on heat energy.
2. Participate in class discussion on heat energy.
3. List examples of the uses of heat energy.
4. Perform experiment with the conduction of heat through different materials.

TASK # 61

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: The Transmission of Mechanical Power

TASK: Identify and Discuss Three Forms of Motion.

CRITERION REFERENCED MEASURE: List and describe the following forms of motion:

- a. Rotary
- b. Reciprocating
- c. Linear

PERFORMANCE GUIDES:

1. Read assignments on the forms of motion.
2. Participate in class discussion on forms of motion.
3. List three forms of motion.
4. Perform motion experiments.
5. Summarize forms of motion.
6. Describe uses of rotary, reciprocating, and linear motion.

TASK # 62

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: The Transmission of Mechanical Power

TASK: Identify and Discuss the Six Basic Machines.

CRITERION REFERENCED MEASURE: List and describe the following basic machines:

1. Lever
2. Wheel and axle
3. Inclined plane
4. Wedge
5. Screw
6. Pulley

PERFORMANCE GUIDES:

1. Read assignments on basic machines.
2. Participate in class discussions on basic machines.
3. List six basic machines.
4. Perform experiments involving basic machines.
5. Cite everyday uses of the six basic machines.

TASK # 63

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: The Transmission of Mechanical Power

TASK: Develop Skill in Assembling Gear Trains for Mechanical Advantage.

CRITERION REFERENCED MEASURE: Given the appropriate tools and materials demonstrate skills in assembling gear trains for mechanical advantage.

PERFORMANCE GUIDES:

1. Read assignments on gear train advantages.
2. Participate in class discussion on gear trains.
3. Participate in demonstration on assembling gear trains.
4. Successfully assemble a gear train using
    a. Spur gears
    b. Helical gears
    c. Bevel and miter gears
    d. Worm gears

TASK # 64

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: The Transmission of Mechanical Power

TASK: Develop Skill in Assembling Vee-Belt Drives for Speed Reduction or Increase.

CRITERION REFERENCED MEASURE: Given appropriate tools and materials demonstrate skill in assembling Vee-belt drives for speed reduction or increase.

PERFORMANCE GUIDES:

1. Read assignments on Vee-belt drives.
2. Participate in class discussions on Vee-belts.
3. Participate in demonstration on assembling Vee-belt drives.
4. Successfully assemble a Vee-belt drive.

TASK # 65

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Fluid Power

TASK: Define the Term Fluid Power.

CRITERION REFERENCED MEASURE: Define the term fluid power as the generation, control, and application of smooth effective power by means of pumped or compressed fluids (liquids or gases).

PERFORMANCE GUIDES:

1. Read assignments on fluid power.
2. Observe teacher demonstration on fluid power.
3. Perform experiment in fluid power.
4. List advantages of fluid power.

TASK # 66

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Fluid Power

TASK: Define the Term Hydraulics.

CRITERION REFERENCED MEASURE: Define the term hydraulics as the flow of liquids in tanks and pipes under various conditions and the ways of directing this flow to useful ends.

PERFORMANCE GUIDES:

1. Read assignment on hydraulics.
2. Observe teacher demonstration on hydraulics.
3. Perform and summarize hydraulic experiments.
4. List examples of the uses of hydraulics.

TASK # 67

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Fluid Power

TASK: Define the Term Pneumatics.

CRITERION REFERENCED MEASURE: Define the term pneumatics as the application of the properties of gases, such as pressure, density, conversion, compression and expansion.

PERFORMANCE GUIDES:

1. Read assignments on pneumatics.
2. Observe teacher demonstration/presentation on pneumatics.
3. Perform and summarize pneumatic experiments.
4. Give examples of the uses of pneumatics.

TASK # 68

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Fluid Power

TASK: Describe the Concept of Fluids in Motion.

CRITERION REFERENCED MEASURE: Describe the concept of fluids in motion as the operation of fluid power systems involving such characteristics of fluids as: volume and velocity of flow, steady and unsteady flow and stream-lined and turbulent flow.

PERFORMANCE GUIDES:

1. Read assignments on fluids in motion.
2. Observe teacher presentation on fluids in motion.
3. Perform hydraulic and pneumatic experiments.

TASK # 69

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Fluid Power

TASK: Describe the Measurement of Pressure.

CRITERION REFERENCED MEASURE: Describe the concept and methods of measuring pressure.

PERFORMANCE GUIDES:

1. Read assignments on the measurement of pressure.
2. Perform hydraulic/pneumatic experiments.

TASK # 70

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Fluid Power

TASK: Demonstrate a Knowledge of why Gases may be Compressed and Fluids cannot be Compressed.

CRITERION REFERENCED MEASURE: Explain how and why gases may be compressed but why fluids cannot be compressed.

PERFORMANCE GUIDES:

1. Read assignments on the compression of gases and fluids.
2. Observe teacher presentations on compression.
3. Perform fluid power experiments using gases and fluids.

TASK # 71

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Fluid Power

TASK: Discuss the Transmission of Power through Fluids.

CRITERION REFERENCED MEASURE: Describe how power is transmitted through fluids.

PERFORMANCE GUIDES:

1. Observe teacher presentation on transmission of power through fluids.
2. Read assignments on transmission of power through fluids.
3. Perform fluid experiments.

TASK # 72

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Fluid Power

TASK: Explain how Force may be Converted to Pressure.

CRITERION REFERENCED MEASURE: Describe how force may be converted to pressure.

PERFORMANCE GUIDES:

1. Read assignments on force and pressure.
2. Solve problems mathematically involving force and pressure.

TASK # 73

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: Careers in Power Mechanics

TASK: List and Discuss Career Opportunities in Power Mechanics.

CRITERION REFERENCED MEASURE: Identify and describe career opporunities in power mechanics technology.

PERFORMANCE GUIDES:

1. Observe teacher presentation on careers in power mechanics.
2. Participate in class discussions on careers in power mechanics.
3. List several opportunities for careers in power mechanics including:
   a. Entry level training requirements.
   b. Salary levels and benefits
   c. Working conditions
   d. Advancement opportunities
   e. Application for employment
4. Select and prepare a report on an employment or career in power mechanics.

TASK # 74

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: The Servicing Enterprise

TASK: Identify and Discuss the Divisions and Positions of Employment of Typical Engine Service Repair Companies.

CRITERION REFERENCED MEASURE: List and describe the various divisions and positions of employment within a small engine service and repair company.

PERFORMANCE GUIDES:

1. Observe teacher presentation on employment in engine repair.
2. Identify divisions of a small engine servicing enterprise.
3. Participate in a small engine servicing enterprise.

TASK # 75

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: The Servicing Enterprise

TASK: Demonstrate a Knowledge of the Functions of a Mechanic and Service Writer in a Small Engine Repair and Service Facility.

CRITERION REFERENCED MEASURE: Describe the functions of a small engine repair and service facility mechanic and service writer.

PERFORMANCE GUIDES:

1. Participate in class discussions on functions of mechanic and service writers.
2. Formulate an outline of the functions of a small engine mechanic.
3. Formulate an outline of the functions of a service writer.
4. Given a parts catalog, demonstrate the proper procedure in identifying and ordering of parts.

TASK # 76

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: The Service Enterprise

TASK: Develop Skills in Engine Trouble-Shooting.

CRITERION REFERENCED MEASURE: Given the appropriate tools and materials demonstrate skills in engine trouble shooting.

PERFORMANCE GUIDES:

1. Read assignment on engine trouble shooting.
2. Participate in class discussion on trouble shooting.
3. Participate in demonstrations on trouble shooting.
4. Successfully trouble-shoot an engine malfunction.
5. Participate in the class service enterprise.

TASK # A.I.A.S.A.

AREA OF COMPETENCE: Energy and Power II

CONTENT/CONCEPT: In Class Industrial Arts Student Association

TASK: Participation (involvement) in a democratic organization with activities using course content.

CRITERION REFERENCED MEASURE: Participate with other students in organized activities using industrial resources, leadership or followership, service or enterprise projects and recognition for workmanship.

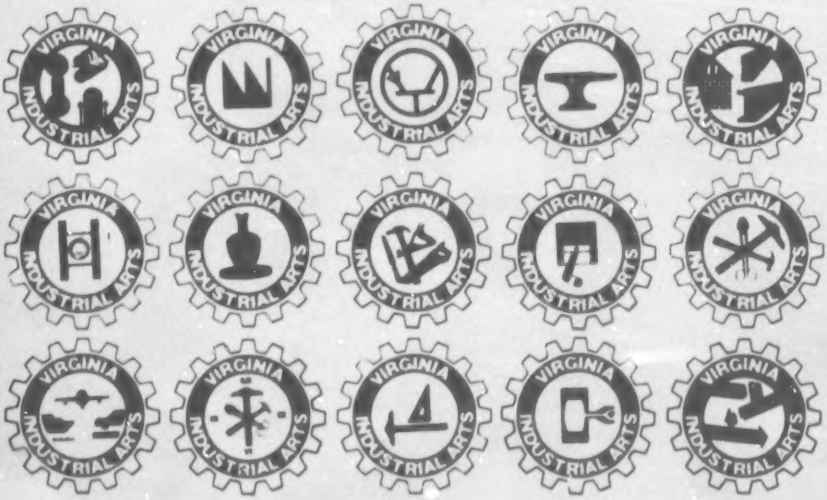
PERFORMANCE GUIDES:

1. Organize class into personnel system for democratic decision making and leader/follower development.
2. Invite speakers to class and use resources of industry and technology from the community.
3. Carry out worthy group activities and projects to improve or serve school or community.
4. Operate an enterprise system to produce item of economic value.
5. Encourage competition in areas of course to motivate and recognize achievement.

NOTE: These performance guides are expanded in the publication titled Student Association Activities in Industrial Arts Instruction available from the Industrial Arts Service, Virginia Department of Education, Richmond, Virginia 23216.

A CATALOG OF TASKS
FOR
COMPETENCY-BASED INSTRUCTION
IN

Graphic Communications
I & II


VIRGINIA INDUSTRIAL ARTS

Industrial Arts Education Service
Department of Education
Commonwealth of Virginia
Richmond, Virginia 23216
1979

This Catalog of Tasks
Was Prepared At
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INTRODUCTION

In the summer of 1977, The Industrial Arts Curriculum K-12 was introduced. This plan outlined the preferred courses, course sequences, and purposes which should be addressed in Virginia industrial arts programs. However, the model curriculum plan did not establish exact knowledge, skills, and attitudes which all learners should possess as they exit particular programs.

The purpose of the following competency catalog of tasks is to establish a basis for program content selection and criterion levels from which one may measure to see if individual learners have achieved a minimal level of competence through study in a particular course. In this manner a means to improve education and its accountability to citizenry can be designed based upon the identification and attainment of prespecified outcomes for the industrial arts content area. Although this catalog is designed and presented in a sequencial order of task statements, it does not mean that it must be structured into local programs in this order. Individual instructors may choose to restructure the sequence of competency tasks to meet local needs.

In preparing this catalog considerable research and validation was undertaken to specify those minimal tasks which every learner enrolling in the course should be able to perform. The format of this and other catalogs includes the following areas: area of competence, content/concept, task, criterion referenced measure, and performance guides. The area of competence identifies the industrial arts course for which the particular task was prepared. Content/concept identifies the sub-area with which the particular task is associated. The task is the knowledge, skills or attitudes which the learner should possess after instruction in the industrial arts class. Criterion references measures are means to identify if the learner can successfully perform the stated task and finally, performance guides are sub-tasks which lead to the development of the knowledge, skills and attitudes

identified in the tasks. These areas are illustrated in Table 1. It should be noted that performance objectives have been omitted from the catalogs of tasks. This was done to allow individual instructors to develop objectives they see necessary to meet the local learning environment.

In Table 2 is identified the location of this course in the total program of industrial arts for Virginia. Other competency catalogs are contained in this publication and the remaining catalogs may be obtained from the Industrial Arts Education Service, Division of Vocational Education, Department of Education, P.O. Box 6Q, Richmond, Virginia 23216.

FORMAT DESCRIPTION

AREA OF COMPETENCE: Identifies the industrial arts course for which the particular task was prepared.

CONTENT/CONCEPT: Identifies the sub-area which the particular task is associated.

TASK: Identifies the knowledge, skills, or attitudes which the learner should possess after completing instruction in the industrial arts class.

CRITERION REFERENCED MEASURE: The means to identify if the learner can successfully perform the stated task.

PERFORMANCE GUIDES: Identifies sub-tasks which lead to the development of the knowledge, skills, and attitudes identified in the tasks.

TABLE 1

The Industrial Arts Curriculum

Level	Goal	Program
Elementary School	Learning Reinforcement	Industrial Arts activities integrated within the elementary curriculum
Middle or Junior High School	Orientation and Exploration	Exploring Technology Modern Industry Construction Manufacturing
High School	Technical	Communication Technology Materials and Processes Technology Power and Transportation Technology Architectural Drawing Basic Technical Drawing Electricity and Electronics Energy and Power Engineering Drawing ■ Graphic Communications Metals Technology Woods Technology
	Personal Enrichment	General Industrial Arts Industrial Crafts

TABLE 2

VIRGINIA INDUSTRIAL ARTS

GRAPHIC COMMUNICATIONS I

COURSE DESCRIPTION:

Graphic Arts deals with printed images in such forms as newspapers, books, printed T-shirts, signs, photographs, wallpaper or stationary. Students use a variety of graphic arts equipment and processes to make visual projects with different materials. Students design, plan and reproduce products like the graphic arts industry. Cameras, printing presses and copy machines are among the many equipment items students use.

COURSE GOALS:

Experiences and activities of this INDUSTRIAL ARTS course will enable the student to:

1.1 define the major elements of production and consumption of goods and services; including design of the product, composition of the materials, purchasing materials, processing and delivery of materials.

1.2 analyze and explain the roles of management and labor as they relate to graphic arts technology.

1.3 evaluate the elements of good design and interpret printing needs through problem-solving techniques.

2.1 demonstrate the safe use of equipment, supplies, materials and processes that are related to graphic arts technology.

2.2 increase proficiency through the use of the materials, equipment and techniques related to the graphic arts industry.

2.3 analyze processes and techniques by combining, contrasting and evaluating printing problems as they relate to graphic arts technology.

3.1 exhibit a willingness to discuss technical aspects of graphic arts technology with other students.

3.2 generate a positive attitude toward equipment operation and safe operating procedures.

33. discuss the positive and negative aspects of various graphic arts positions as they relate to career outlooks.

SUGGESTED TOPICAL OUTLINE:

I. Introduction to Graphic Arts Technology

II. Job Planning and Layout

III. Image Generation - Cold Composition

IV. Reproduction and Production

V. Binding, Finishing and Packaging

VI. Purchasing and Inventory

VII. Management and Labor

VIII. The Industrial Arts Student Association

TASK # 1

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Introduction to Graphic Arts Technology

TASK: Observe the Purpose and Influence of Graphic Arts Technology.

CRITERION REFERENCED MEASURE: Describe the purpose and impact of graphic arts technology upon people and societies.

PERFORMANCE GUIDES:

1. Read assignments on the purpose and influence of graphic arts technology.
2. Participate in class discussion on the purpose and influence of graphic arts technology.
3. List uses of graphic arts technology.
4. Define graphic arts technology.

TASK # 2

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Introduction to Graphic Arts Technology

TASK: Use Graphic Arts Materials and Equipment Safely.

CRITERION REFERENCED MEASURE: Demonstrate skills in the safe use of materials, equipment and processes used in graphic arts technology.

PERFORMANCE GUIDES:

1. Read text on graphic arts safety.
2. Complete an assignment on safety in graphic arts.
3. Review manuals/instructions on materials, equipment and processes in graphic arts.
4. Perform safely in the graphic arts lab.

TASK # 3

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Introduction to Graphic Arts Technology

TASK: Differentiate Between the Basic Processes of Transferring an Image.

CRITERION REFERENCED MEASURE: Discuss the various image transfer processes and differentiate between each including relief, gravure, offset, screen processing, electrostatic, and continuous tone photography.

PERFORMANCE GUIDES:

1. Participate in class discussion on the basic processes.
2. Do assignments related to the basic processes of image transfer.
3. Compare a sample of each process discussed.

TASK # 4

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Design Principles

TASK: List the Important Design Principles.

CRITERION REFERENCED MEASURE: Recall the important design principles such as balance, contrast, rhythm, proportion and unity.

PERFORMANCE GUIDES:

1. Review text on design principles.
2. Review in class the most important design principles.
3. View a sample of these principles - balance, contrast, rhythm, proportion and unity.

TASK # 5

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Job Planning and Layout

TASK: Use Correct Procedures to Make Thumbnail Sketches, Rough Layouts and Comprehensive Layouts.

CRITERION REFERENCED MEASURE: Make a copy of each type of the following layouts: thumbnail sketches, rough layouts and comprehensive layouts.

PERFORMANCE GUIDES:

1. Participate in class discussions of each type of layout - thumbnail sketches, rough layouts and comprehensive layouts.
2. Complete selected assignments related to thumbnail sketches, rough layouts and comprehensive layouts.

TASK # 6

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Job Planning and Layout

TASK: Develop Skills in Making a Dummy.

CRITERION REFERENCED MEASURE: Construct a dummy for a job you wish to print.

PERFORMANCE GUIDES:

1. Discuss the dummy and its use in class.
2. Show the relationship of the dummy to the finished work.
3. Perform selected assignments in the use of a dummy.

TASK # 7

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Image Generation - Cold Composition

TASK: Differentiate Between the Two Basic Classifications of Image Generation.

CRITERION REFERENCED MEASURE: Identify and describe image generation by hot and cold composition.

PERFORMANCE GUIDES:

1. Participate in class discussion on image generation.
2. Complete an assignment using image generation methods.
3. Compare various methods and advantages/disadvantages of each classification of image generation.
4. Write a definition of hot and cold composition.

TASK # 8

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Image Generation - Cold Composition

TASK: Develop Skills in Making Mechanical Layout or Camera-Ready Artwork.

CRITERION REFERENCED MEASURE: Demonstrate skill in making a mechanical layout or using camera-ready artwork.

PERFORMANCE GUIDES:

1. View examples of mechanical layouts and camera-ready artwork.
2. Discuss in class both mechanical layout and camera-ready artwork.
3. Complete a selected assignment related to mechanical layout and camera-ready artwork.
4. Practice using tools, equipment, and supplies involved in mechanical layout and camera-ready artwork.

TASK # 9

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Image Generation - Cold Composition

TASK: Develop Skills in the Use of Clip Art and Preprinted Type.

CRITERION REFERENCED MEASURE: Demonstrate skills in using clip art and preprinted type in a layout.

PERFORMANCE GUIDES:

1. Discuss the use of clip art and preprinted type in class.
2. Perform selected assignments based on the use of clip art and preprinted type.

TASK # 10

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Image Generation - Cold Composition

TASK: Develop Skills in the use of a Typewriter for Strike-on Image Generation.

CRITERION REFERENCED MEASURE: Produce a strike-on image generation by using a typewriter.

PERFORMANCE GUIDES:

1. Participate in class discussion of strike-on image generation.
2. Complete a selected assignment dealing with the proper use of the typewriter.

TASK # 11

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Image Generation - Cold Composition

TASK: Develop Skills in Photocomposition.

CRITERION REFERENCED MEASURE: Demonstrate the procedure used in photocomposition.

PERFORMANCE GUIDES:

1. Discuss photocomposition in class.
2. Review machine manuals.
3. Choose and produce an image generation by this method.
4. Develop film.
5. Position on the layout correctly.
6. Perform a selected assignment dealing with photocomposition.

TASK # 12

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Image Generation - Cold Composition

TASK: Take Photographs with a Camera.

CRITERION REFERENCED MEASURE: Develop skills in the use of a camera to make continuous tone photographs for use in image generation.

PERFORMANCE GUIDES:

1. Discuss in class the proper use of the camera.
2. Discuss in class the terms composition, film use, lighting, etc.
3. Review the camera manual.
4. Complete a photographic assignment on camera use.

TASK # 13

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Image Generation - Cold Composition

TASK: Develop Skill in Roll Film Development.

CRITERION REFERENCED MEASURE: Demonstrate skill in developing black and white roll film.

PERFORMANCE GUIDES:

1. Read assignment on roll film development.
2. Observe teacher demonstration on roll film development.
3. Discuss chemicals and order used in developing roll film.
4. Load film in developing tank.
5. Develop roll film.

TASK # 14

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Image Generation - Cold Composition

TASK: Develop Skill in Making Photographic Prints.

CRITERION REFERENCED MEASURE: Demonstrate skill in making black and white photographic prints.

PERFORMANCE GUIDES:

1. Read assignment on making photographic prints.
2. Observe teacher demonstration on making photographic prints.
3. Practice adjusting and using an enlarger.
4. Review chemical preparation and development times.
5. Practice making contact prints.
6. Make enlargements.
7. Finish prints.
8. Mount prints.

TASK # 15

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: List the Basic Materials and Equipment Needed for Screen Process Printing.

CRITERION REFERENCED MEASURE: Identify the basic materials and equipment used in screen printing such as ink, screen, stencil and squeegee.

PERFORMANCE GUIDES:

1. Read text unit of procedures used in screen printing.
2. Review equipment manuals and/or instructions.
3. Watch teacher demonstration on use of materials and equipment in making a screen print.
4. Use the materials and equipment involved in screen printing to complete an assignment.

TASK # 16

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Develop Skill in Preparing Stencils for Screen Process Printing.

CRITERION REFERENCED MEASURE: Demonstrate skill in preparing screen process printing stencils using the following methods: paper, hand-cut film, and photographic.

PERFORMANCE GUIDES:

1. Read assignments on stencil preparation.
2. Observe teacher presentations on paper, hand-cut film, photo-direct, and photo-indirect stencil preparation.
3. Complete assignment on stencil preparation.

TASK # 17

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Develop Skills in Using Types of Block-out.

CRITERION REFERENCED MEASURE: Produce a screen process print that has been blocked out by use of paper mask or liquid mask.

PERFORMANCE GUIDES:

1. Read text unit on block-out methods.
2. Observe demonstration of paper mask and liquid mask.
3. Complete an assignment dealing with paper mask and liquid mask.

TASK #18

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Match Various Types of Inks, Stencils, and Solvents for Screen Process Printing.

CRITERION REFERENCED MEASURE: Choose the correct type of ink for the type of film using and select the correct solvent for removing the ink and the stencil in screen process printing.

PERFORMANCE GUIDES:

1. Review text relating to ink, stencils, and solvents.
2. Observe demonstration on proper removal of inks and stencils.
3. Select the proper ink solvent and stencil solvent for printing jobs.
4. Perform a selected assignment using ink, solvent, and stencils.

TASK #19

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Identify various types of papers.

CRITERION REFERENCED MEASURE: Differentiate between types of paper used in printing and identify the correct paper for the job.

PERFORMANCE GUIDES:

1. Participate in class discussion on paper type.
2. Observe samples of various types of papers.
3. Handle various types of paper.
4. Complete selected assignment using two or more different types of paper.

TASK #20

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Binding, Finishing and Packaging

TASK: Develop Skills in the Safe use of a Paper Cutter.

CRITERION REFERENCED MEASURE: Use the paper cutter to cut paper to a predetermined size.

PERFORMANCE GUIDES:

1. Review cutter manual.
2. Observe the cutter in use.
3. Review the safety procedure.
4. Use the cutter to size paper.

TASK #21

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Handle Combustible Materials Safely.

CRITERION REFERENCED MEASURE: Develop skills in safety practices concerning combustible chemicals used in graphic arts.

PERFORMANCE GUIDES:

1. Complete assignment on combustible materials.
2. Observe demonstration on the safe use of combustible material.
3. Recall the procedure for using combustible materials.
4. Handle combustible materials safely.

TASK #22

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Develop Skills in Making Positives and Negatives to use in the Photographic Indirect Screen Process Printing Method.

CRITERION REFERENCED MEASURE: Make a positive and negative print using the photographic indirect stencil method for screen processing.

PERFORMANCE GUIDES:

1. Participate in class discussion on photographic indirect screen process printing.
2. Observe demonstration of positive and negative printing.
3. Do a selected assignment relevant to printing the positive and negative print.

TASK # 23

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Make a Two-color Print.

CRITERION REFERENCED MEASURE: Develop skills in registering more than one color using the screen process printing method.

PERFORMANCE GUIDES:

1. Review text unit on two-color print process.
2. Discuss in class the procedures used.
3. Observe demonstration of two-color printing.
4. List the steps involved.
5. Perform selected assignment involving two-color prints.

TASK #24

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: List and Describe the Parts of the Process Camera.

CRITERION REFERENCED MEASURE: Identify the parts and function of the process camera.

PERFORMANCE GUIDES:

1. Read the unit on the use of the process camera.
2. Study the process manual instruction booklet.
3. Define the parts and function of each basic camera part.
4. Do a selected assignment using the process camera.

TASK #25

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Image Generation - Cold Composition

TASK: Reduce and Enlarge Artwork.

CRITERION REFERENCED MEASURE: Develop skills in using a proportion scale or rule for reduction and enlargement sizes.

PERFORMANCE GUIDES:

1. Read text on the use of the proportion scale.
2. Discuss in class reducing and enlarging.
3. Do an assignment on reducing and enlarging.
4. Use a proportional scale in a selected assignment.

TASK #26

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Develop Skill in Preparing the Camera for Enlarged, Reduced or 100% Sized Copies.

CRITERION REFERENCED MEASURE: Demonstrate the correct camera setup for enlarging, reducing and actual size reproduction.

PERFORMANCE GUIDES:

1. Read text on proper use of the camera and setup for various size reproductions.
2. View demonstrations of actual setup (actual size, enlarged and reduced).
3. Complete assignments dealing with enlarging, reducing and actual size setup.
4. List the steps involved in various camera preparations.

TASK #27

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Expose and Process a Line Negative and Positive.

CRITERION REFERENCED MEASURE: Demonstrate skills in the procedure of exposing and processing a line negative and positive.

PERFORMANCE GUIDES:

1. Read the unit of exposure and development of line negatives and positives.
2. Observe a demonstration of this process.
3. Expose the film.
4. Process the negative/positive.

TASK #28

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Image Generation - Cold Composition

TASK: Differentiate between Line Copy, Halftone Copy, and Continuous Tone Copy.

CRITERION REFERENCED MEASURE: Identify a line copy, halftone copy, and a continuous tone copy when presented samples.

PERFORMANCE GUIDES:

1. Participate in class discussion dealing with line, halftone and continuous tone copy.
2. Observe samples of each type of copy.
3. Do a selected assignment using line, halftone and continuous tone copy.

TASK #29

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Develop Skills in Stripping and Making a Flat.

CRITERION REFERENCED MEASURE: Produce a finished flat involving the use of stripping.

PERFORMANCE GUIDES:

1. Read and study text related to stripping.
2. Observe class demonstration on the correct process.
3. Complete assignment on proper procedure of stripping and making a flat.
4. Make a stripped flat.

TASK #30

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Compare and Contrast Metal, Plastic and Paper Plates.

CRITERION REFERENCED MEASURE: Identify the advantages/disadvantages of metal, plastic and paper plates in offset lithography.

PERFORMANCE GUIDES:

1. Read the text section on different plate types.
2. Compare a sample of metal, plastic and paper plates and their results.
3. Complete a selected assignment dealing with a plate or plates.
4. Practice producing paper, metal, and/or plastic offset plates.

TASK #31

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Explain the Basic Principle of Offset Operation.

CRITERION REFERENCED MEASURE: Define the basic steps used in offset printing such as ink adjustments, water adjustments and feed adjustments.

PERFORMANCE GUIDES:

1. Read the text unit on offset printing.
2. View a demonstration of offset printing.
3. Observe samples of offset printing.
4. Complete an assignment on offset printing.
5. List the basic steps used in offset printing.

TASK # 32

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Reproduction and Production

TASK: Develop Skill in Operating the Offset Press.

CRITERION REFERENCED MEASURE: Demonstrate skill in the operation of the offset press including adjusting ink, water, and feed systems.

PERFORMANCE GUIDES:

1. Read assignment on the operation of the offset press.
2. Observe teacher preparation on operating and adjusting the offset press.
3. Practice using the offset press.
4. Complete assignments employing the offset press.

TASK #33

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Binding, Finishing and Packaging

TASK: Explain the Importance of Binding, Finishing and Packaging Products.

CRITERION REFERENCED MEASURE: Describe the importance of binding, finishing and packaging products as related to graphic arts.

PERFORMANCE GUIDES:

1. Read the text units on binding, finishing and packaging products.
2. Observe a binding or packaging plant.
3. Do assignments or group projects on procedures involved in binding, finishing and packaging products.
4. Bind or package a product.

TASK #34

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Purchasing and Inventory

TASK: Develop Skills in Determining the Cost of Paper.

CRITERION REFERENCED MEASURE: Tabulate the cost of paper for selected printing jobs.

PERFORMANCE GUIDES:

1. Discuss in class these cost factors of paper:
   a. Size
   b. Recut size
   c. Amount
   d. Grade
2. Price various sizes, grades and amounts of paper.
3. Handle various grades of paper.
4. Complete a selected assignment in determining the cost of paper.

TASK #35

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Purchasing and Inventory

TASK: Differentiate Between Several Kinds of Ink Used in Printing.

CRITERION REFERENCED MEASURE: Compare various types of ink and list their advantages and disadvantages for various jobs.

PERFORMANCE GUIDES:

1. Read text content concerning ink varieties.
2. Use various types of inks.
3. List different types of ink and their uses.

TASK # 36

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: Management and Labor

TASK: Discuss the Types of Jobs Available and the Qualifications Needed for Graphic Arts Technology.

CRITERION REFERENCED MEASURE: List various graphic arts jobs and the requirement and qualifications for each.

PERFORMANCE GUIDES:

1. Read text unit on graphic arts opportunities.
2. Complete assignments on graphic arts jobs and qualifications.
3. Participate in class discussion on the job market.
4. View audio visual and/or employment agent talk on graphic arts opportunities.

TASK # A.I.A.S.A.

AREA OF COMPETENCE: Graphic Communications I

CONTENT/CONCEPT: In Class Industrial Arts Student Association

TASK: Participation (involvement) in a democratic organization with activities using course content.

CRITERION REFERENCED MEASURE: Participate with other students in organized activities using industrial resources, leadership or followership, service or enterprise projects and recognition for workmanship.

PERFORMANCE GUIDES:

1. Organize class into personnel system for democratic decision making and leader/follower development.
2. Invite speakers to class and use resources of industry and technology from the community.
3. Carry out worthy group activities and projects to improve or serve school or community.
4. Operate an enterprise system to produce item of economic value.
5. Encourage competition in areas of course to motivate and recognize achievement.

NOTE: These performance guides are expanded in the publication titled Student Association Activities in Industrial Arts Instruction available from the Industrial Arts Service, Virginia Department of Education, Richmond, Virginia 23216.

GRAPHIC COMMUNICATIONS II

COURSE DESCRIPTION:

Students use advanced graphic arts processes to design, plan and reproduce products like the graphic arts industry. Operation of self-owned graphic arts firm is emphasized.

COURSE GOALS:

Experiences and activities of this INDUSTRIAL ARTS course will enable the student to:

1.1 identify the management practices which are necessary for producing a product.

1.2 exhibit knowledge of career opportunities in the graphic arts industry.

1.3 describe the need for production control.

2.1 produce graphic arts products using the reproduction techniques generally found in the graphic arts industry.

2.2 demonstrate the interrelationship of design, layout, job planning and production as used in industry.

2.3 interrelate the responsibilities of personnel to the design and production of a graphic arts product.

3.1 identify the safety measures necessary in a graphic arts plant.

3.2 plan wisely before producing goods and services

3.3 generalize on the importance of design principles in developing a product

SUGGESTED TOPICAL OUTLINE:

I. Review of Graphic Arts Technology

II. Job Planning

III. Graphic Design Principles

IV. Reproduction and Production

V. Binding, Finishing and Packaging

VI. Establishing and Operating a Graphic Arts Firm

VII. Management Practices for the Free Enterprise

VIII. The Industrial Arts Student Association

TASK # 37

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Job Planning and Layout

TASK: Develop Skills in the use of Materials and Equipment in Job Planning and Layout.

CRITERION REFERENCED MEASURE: Complete an assignment involving the use of materials and equipment in job planning and layout.

PERFORMANCE GUIDES:

1. Participate in class discussion on various materials and equipment for job planning and layout.
2. Practice use of materials and equipment used in job planning and layout.
3. Complete selected assignments using materials and equipment used in job planning and layout.

TASK # 38

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Design Principles

TASK: Develop Skills in the Composing of Thumbnail Sketches, Rough Layouts, and Comprehensive Layouts.

CRITERION REFERENCED MEASURE: Demonstrate skill in composing an acceptable layout using thumbnail sketches, rough layouts and comprehensive layouts.

PERFORMANCE GUIDES:

1. Review text content of layout development.
2. Observe samples of each type of layout.
3. Perform selected job assignments on thumbnail sketching, rough layouts and comprehensive layouts.

TASK # 39

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Design Principles

TASK: Discuss the Identification of Color with Objects and Situations.

CRITERION REFERENCED MEASURE: Relate the use of color with objects and situations for selected printing jobs.

PERFORMANCE GUIDES:

1. Review the text content dealing with color.
2. View objects and situations using different colors.
3. Match colors and objects/situations.

TASK # 40

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Design Principles

TASK: Develop Skills in Using Screen Tints, Reverse Printing, Element Size and Shape, and other Types of Emphasizing or Contrasting Graphic Elements.

CRITERION REFERENCED MEASURE: Demonstrate skill in using screen tints, reverse printing, element size and shape, and other types of emphasizing or contrasting graphic elements in printing jobs.

PERFORMANCE GUIDES:

1. Read text unit on emphasizing and contrasting graphic elements.
2. Observe teacher demonstrations on various methods of emphasizing and contrasting elements.
3. Participate in class discussions on various methods of emphasizing and contrasting elements.
4. List various types of emphasizing and contrasting elements and advantages/disadvantages of each.
5. Perform selected job assignments on using screen tints, reverse printings, and element size and shape.

TASK # 41

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Review of Graphic Arts Technology

TASK: Describe tooling up for production.

CRITERION REFERENCED MEASURE: Explain the procedure for purchasing needed supplies and equipment and tooling up for production.

PERFORMANCE GUIDES:

1. Read text materials relating to purchasing supplies and equipment and "tooling up".
2. Participate in class discussion on purchasing and "tooling up".
3. Complete selected class assignment dealing with a "mock" company.

TASK # 42

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Reproduction and Production

TASK: Develop Skills in Camera Operations and Darkroom Procedures.

CRITERION REFERENCED MEASURE: Demonstrate skill in camera operations and darkroom procedures.

PERFORMANCE GUIDES:

1. Review text unit on the photographic process
2. Watch audio visual of the chemistry of film and paper emulsions.
3. Draw a "cross-section" of film and paper.
4. Make line negative/positive.
5. Make halftone negative/positive.
6. Make continuous tone negative/positive.
7. Demonstrate darkroom safety.

TASK # 43

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Reproduction and Production

TASK: Develop Skills in Choosing the Correct Type of Paper for a Job.

CRITERION REFERENCED MEASURE: Select the correct type of paper for the job to be done considering characteristics, use and cost.

PERFORMANCE GUIDES:

1. Review text content of paper and its use.
2. Use various types of paper.
3. Match paper and job requirements.
4. Review the characteristics of various types of papers.
5. Select the proper paper for assigned jobs.

TASK # 44

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Reproduction and Production

TASK: Develop Skills in Making a Stencil for Screen Process Printing.

CRITERION REFERENCED MEASURE: Make a screen process printing product.

PERFORMANCE GUIDES:

1. Read text unit on screen preparation.
2. Review manufacturer's guide for use of screen/material.
3. Observe teacher demonstration on screen preparation.
4. Practice using "tools" and methods involved in preparing the screen.
5. Make a stencil for screen process printing.
6. Perform selected job assignments on process printing.

TASK # 45

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Reproduction and Production

TASK: List the Main Parts of an Offset Press.

CRITERION REFERENCED MEASURE: Identify the basic parts of an offset press and describe their function.

PERFORMANCE GUIDES:

1. Read text unit (illustrations) on the offset press.
2. Review equipment manual/instructions.
3. View audio visual on the offset press.
4. List and describe the basic parts of the offset press.
5. Perform selected job assignments using the offset press.

TASK # 46

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Reproduction and Production

TASK: Develop Skills in Adjusting the Offset Press.

CRITERION REFERENCED MEASURE: Adjust the offset press for ink, water, pressure, size, and register for specified jobs.

PERFORMANCE GUIDES:

1. Read text material on adjustments of the offset press.
2. Observe demonstration on adjusting the offset press.
3. Review machine manual/instructions on adjusting the press.
4. Perform selected job assignments on the offset press and make the necessary adjustments according to the assignments.

TASK # 47

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Reproduction and Production

TASK: Develop Skills in Making Masters/Plates for Offset Press.

CRITERION REFERENCED MEASURE: Demonstrate skill in making printable plates using either plastic, paper, or metal plates.

PERFORMANCE GUIDES:

1. Read text content pertaining to plate making.
2. Observe teacher demonstration on plate making.
3. Review manufacturer's guide.
4. Watch audio visuals of the process.
5. Perform selected job assignments on plate making.

TASK # 48

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Binding, Finishing and Packaging

TASK: Define the Terms Gathering, Inserting, Collating, Folding, and Binding.

CRITERION REFERENCED MEASURE: Recall the definitions of gathering, inserting, collating, folding and binding.

PERFORMANCE GUIDES:

1. Read text definitions of gathering, inserting, collating, folding and binding.
2. View samples of each.
3. Write an acceptable definition of each.
4. Observe audio visual and/or field trip on the binding, finishing and packaging process.
5. Perform selected assignments on folding and binding.

TASK # 49

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Management Practices for the Free Enterprise.

TASK: Participate in a Class/Group Industry Printing Project.

CRITERION REFERENCED MEASURE: Develop a management production system for producing a product in graphic arts.

PERFORMANCE GUIDES:

1. Read text assignment on careers in the graphic arts industry.
2. Review "Occupational Outlook Handbook" and/or trade school requirements on selected careers in the graphic arts industry.
3. Participate in class discussion on graphic arts jobs and their qualifications.
4. Participate in class activity to develop a "class industry".
5. Perform job assignments related to class project.

TASK # 50

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: Reproduction and Production

TASK: Develop Skills in Producing a Multiple Color Printing Job.

CRITERION REFERENCED MEASURE: Produce a multiple color printing job using offset or screen process printing methods.

PERFORMANCE GUIDES:

1. Read text unit on multiple color printing.
2. Observe teacher demonstration on multiple color printing.
3. Perform selected job assignments on the production of multiple color printing.

TASK # A.I.A.S.A.

AREA OF COMPETENCE: Graphic Communications II

CONTENT/CONCEPT: In Class Industrial Arts Student Association

TASK: Participation (involvement) in a democratic organization with activities using course content.

CRITERION REFERENCED MEASURE: Participate with other students in organized activities using industrial resources, leadership or followership, service or enterprise projects and recognition for workmanship.

PERFORMANCE GUIDES:

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3. Carry out worthy group activities and projects to improve or serve school or community.
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